

Hot-Spinning

HEAVY TANK HEADS

By CHARLES H. WICK

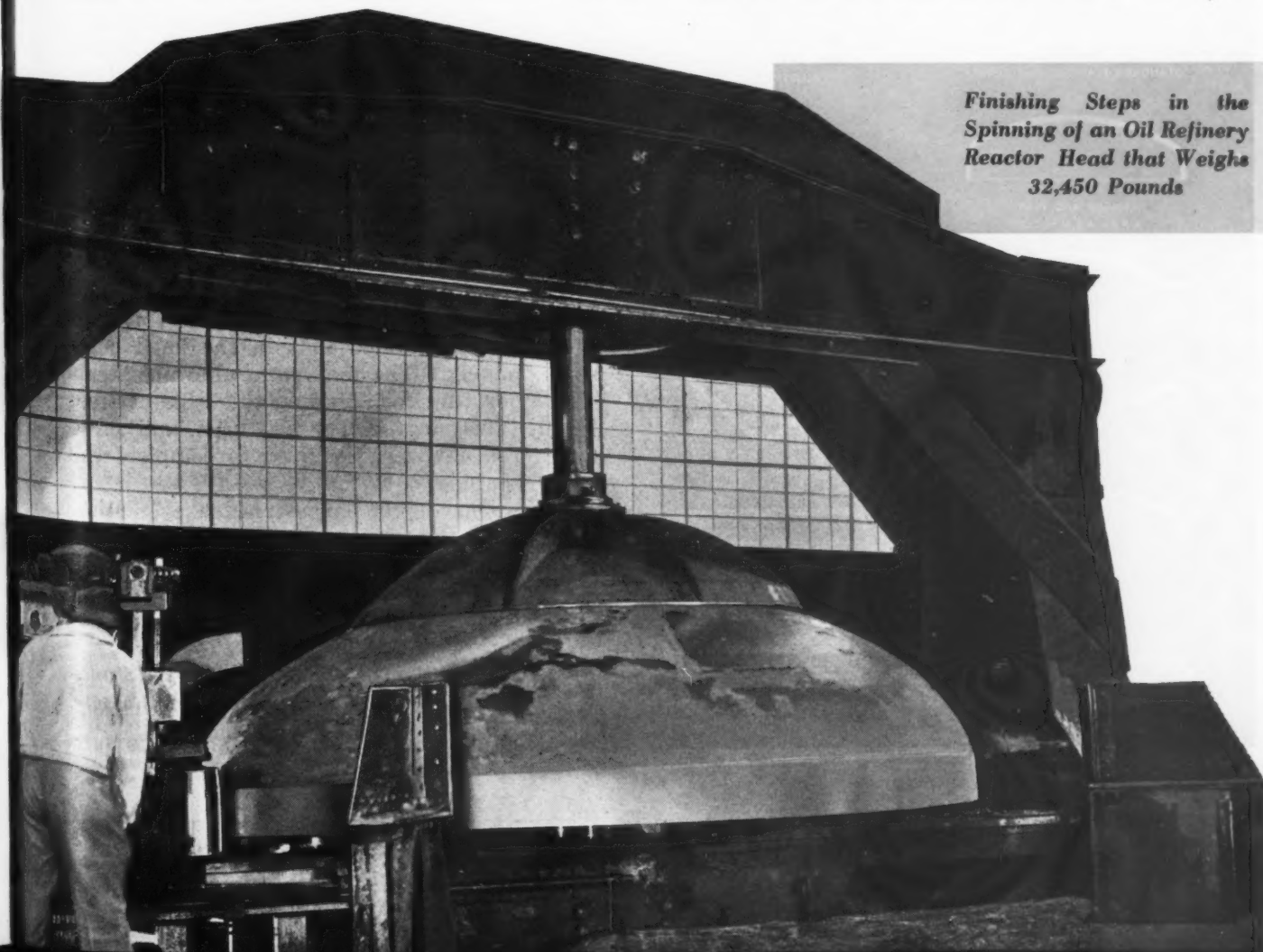
A SPHERE is the strongest structural shape for withstanding uniform pressure. Pressure vessels, consequently, use metal heads that are either spherical or modifications of this shape. Petroleum refineries, chemical plants, storage-tank users, and manufacturers of explosives, foods, and many other products utilize these heads in a variety of sizes and shapes.

Since about 4000 years ago, when the Egyptians placed lumps of clay on revolving wheels and shaped the clay with their hands, spinning has been a fast, accurate, and economical method of

forming curved circular shapes. Modern methods of spinning steel plates, as well as other ferrous and non-ferrous metals, into the many types of heads required for various applications will be described in this article.

In 1885—over half a century ago—Lukens Steel Company, Coatesville, Pa., began the machine spinning of iron and steel plates into heads for boilers, tanks, and other pressure vessels. Before that time, the heads had been formed by crude hand methods. A typical example was the manufacture of a “bumped” head 5 feet in diameter by 7/8 inch

*Finishing Steps in the
Spinning of an Oil Refinery
Reactor Head that Weighs
32,450 Pounds*



HOT-SPINNING HEAVY TANK HEADS

thick. A hole the approximate shape of the required head was dug in the ground, and a heated plate was "bumped" into the depression by means of hand-swung mauls. Six heatings of the plate were necessary, and the operation consumed nine hours. Subsequently, smoothing of the "bumped" portion of the head and forming of the flange were required.

The determination of whether products should be spun or press formed depends upon the size, quantity, and design of the parts. Spinning is generally confined to the manufacture of small quantities of non-standard sizes of heads, where the cost of dies is not justified. The set-up time for spinning is fast, usually requiring approximately fifteen minutes.

Fig. 1 indicates some of the shapes of heads that are spun. The standard for inside corner radii is three times the metal thickness. Heads are always spun to the outside diameters. When the inside

diameter is specified, the heads are spun to the corresponding outside diameter, obtained by adding twice the minimum metal thickness to the inside diameter. Machining of the spun head is necessary if the inside diameter must be maintained to close tolerances.

Formulas for estimating approximate blank sizes vary with the finished shape of the head. For the elliptical dished head, the ratio of the major axis to the minor axis is 2 to 1. Steel, clad steels, nickel, Monel, Inconel, copper, aluminum, stainless steels, and silicon bronze, as well as many other ferrous and non-ferrous metals and alloys, are regularly spun.

One-piece flat circles, 203 inches in diameter, available from Lukens 206-inch mill, have been spun into heads on the large spinning machine at Lukens. Even larger circles—250 inches in diameter—which are made by welding two plates together have been spun into heads. Plates as thick as 6 inches and heads weighing as much as 36,000 pounds can also be spun.

One of the thickest heads spun at this plant was an elliptical dished head with an inside diameter of 72 inches, a minimum thickness of $5 \frac{3}{16}$ inches after forming, a 4-inch long straight flange, and an over-all height of $26 \frac{31}{32}$ inches. A flat, circular plate 105 inches in diameter by 6 inches thick was used for spinning this head. After spinning, the head was normalized, grit-blasted, and machined to a thickness of $4 \frac{7}{8}$ inches.

A combination of press forming and spinning had been contemplated for the manufacture of this head. However, due to the high cost of dies that would have been required for press forming, it was decided to spin the head completely. The maximum allowable temperature for spinning this type of steel (2000 degrees F.) was used, and three reheats were required to complete the shaping.

One of the largest heads ever spun was the flanged and dished A.P.I.-A.S.M.E. code head shown in Fig. 2. This head has an outside diameter of

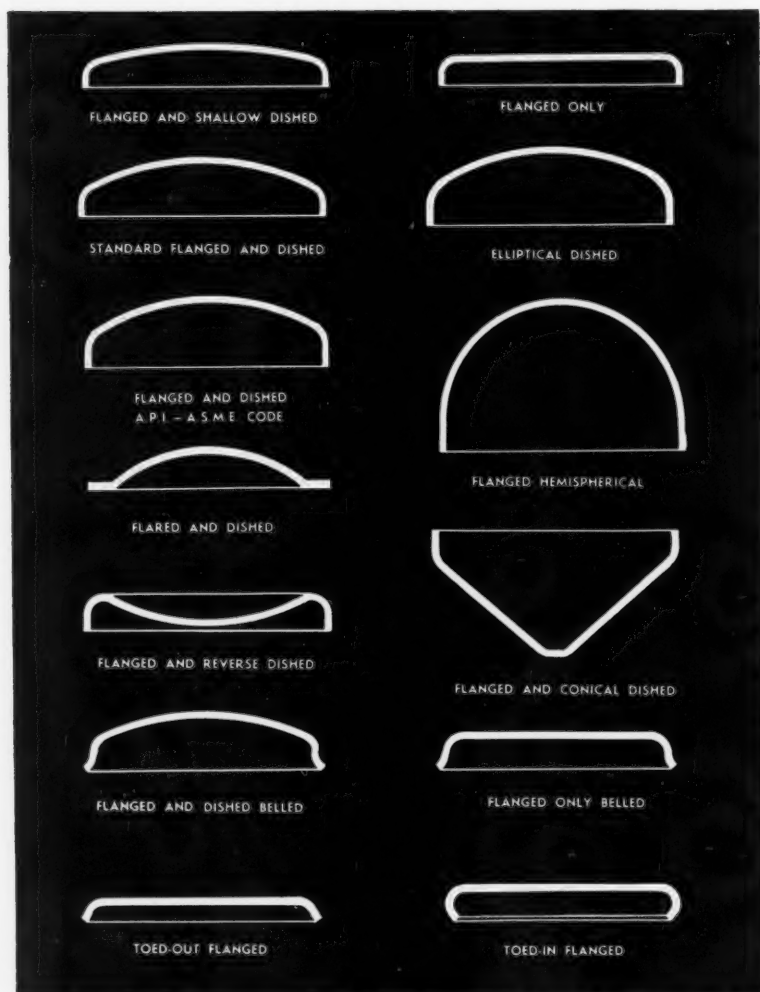


Fig. 1. Cross-sectional Views of Standard Shapes of Heads that are Commonly Formed by Spinning

HOT-SPINNING HEAVY TANK HEADS

Fig. 2. Flanged and Dished Head Measuring 18 Feet 2 1/2 Inches in Outside Diameter and Weighing 15,700 Pounds—One of the Largest and Heaviest Heads Ever Spun

18 feet 2 1/2 inches, a nominal thickness of 1 1/16 inches, a minimum thickness of 7/8 inch, a dish radius of 170 inches, an inside corner radius of 13 inches, a 3 1/8-inch long straight flange, an over-all depth of 48 3/8 inches, and a weight of 15,700 pounds. A flat circle of steel, 20 feet 9 inches in diameter, was used for the spinning. This disk was obtained by welding two steel plates, each 251 inches long and 125 1/2 inches wide, together to form a single plate 251 inches square.

The first spinning machine installed at the Lukens plant in 1885, was limited to the production of "flanged-only" heads having a maximum diameter of 7 feet and a thickness of not more than 1 inch. This machine was belt-driven from a steam engine, and the mechanical parts such as the roller and carriage were hand-operated by means of large wheels. Circular plates were heated in coal-fired furnaces at that time. Charles Lukens Huston, first vice-president of Lukens Steel Company, redesigned this early spinning machine. In the redesigned machine was incorporated for the first time the curved guide for the outside (quadrant) roller, which, with the inside corner roller, forms the corner radius and straight flange of spun heads.

Flat circular blanks for spun heads are sheared or flame-cut from rolled steel plates. Fig. 3 illustrates a rotary shear with circular attachment shearing a circle from a square plate. This machine can shear plates up to 1 inch thick, through 360 degrees, at the rate of 70 feet per minute. Circles having diameters beyond the capacity of the rotary shear and thicknesses greater than 1 inch are flame-cut, as shown in Fig. 4. The torch is adjusted to provide a predetermined type of flame, and moves automatically at the correct speed to furnish a clean, smooth edge and an accurate circle.

The flat circular plates are heated in instrument-controlled furnaces which are fired with natural



gas having a minimum sulphur content. The temperature and heating time vary with the material to be spun. Approximately one hour per inch of thickness is required for heating steel disks to the required temperature. Utilizing more heat to soften the metal causes an increase in scale. Certain steel alloys can be heated as high as 2150 degrees F. in preparation for spinning. This temperature will drop to approximately 1900 degrees F. by the time the plate is ready for spinning.

Before the metal cools so much that it is impossible to continue to form the head by spinning, the machine is stopped and the partly formed head is returned to the furnace for reheating. The formers on the spinning machine are changed while the head is being reheated.

Experiments are being conducted with applying heat to the head while spinning. It is felt that this will be an effective means of lengthening the working time between reheats. The uniform heating and hot-spinning minimize the development of residual strains commonly encountered in heads formed by

HOT-

Fig. 3. Shearing a Circle from a Square Steel Plate in Preparation for Heating and Spinning Operations

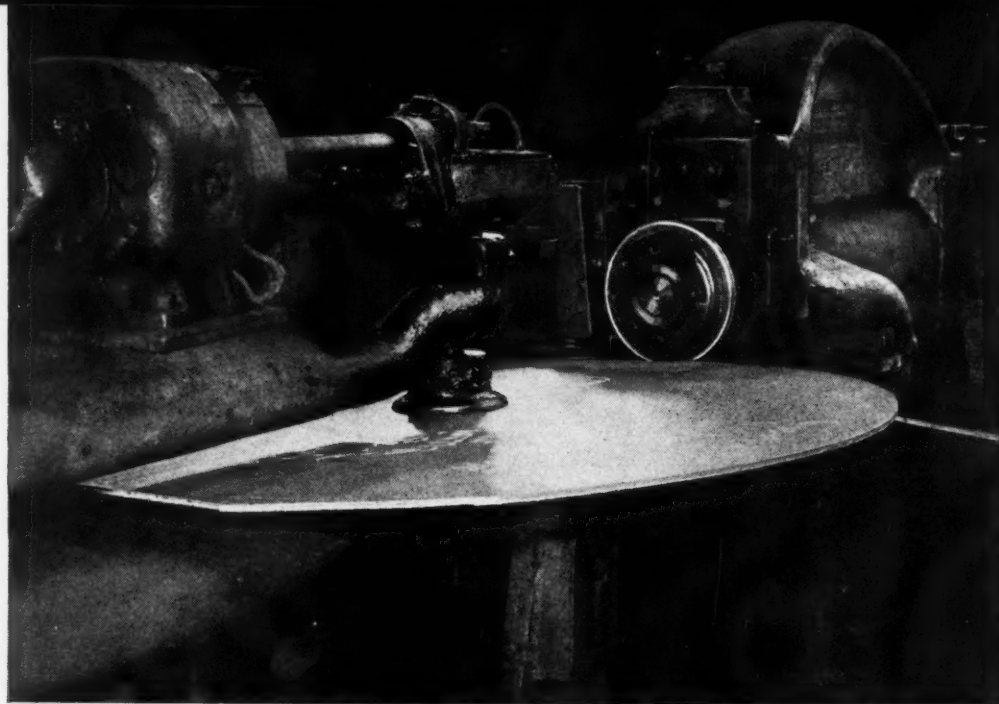


Fig. 4. Flame-cutting a Large Disk from a Heavy Steel Plate for Subsequent Spinning into a Pressure Head

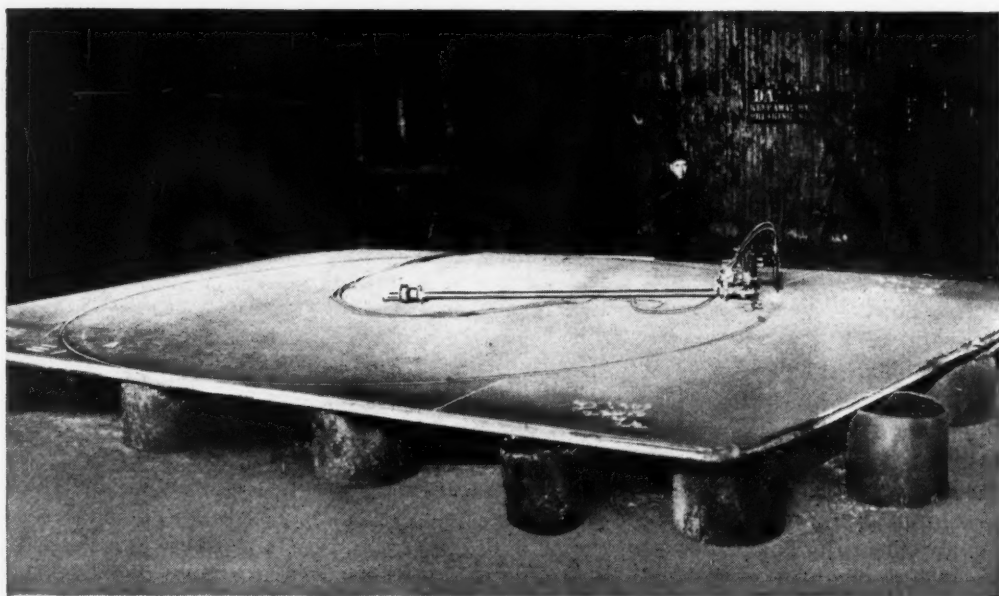
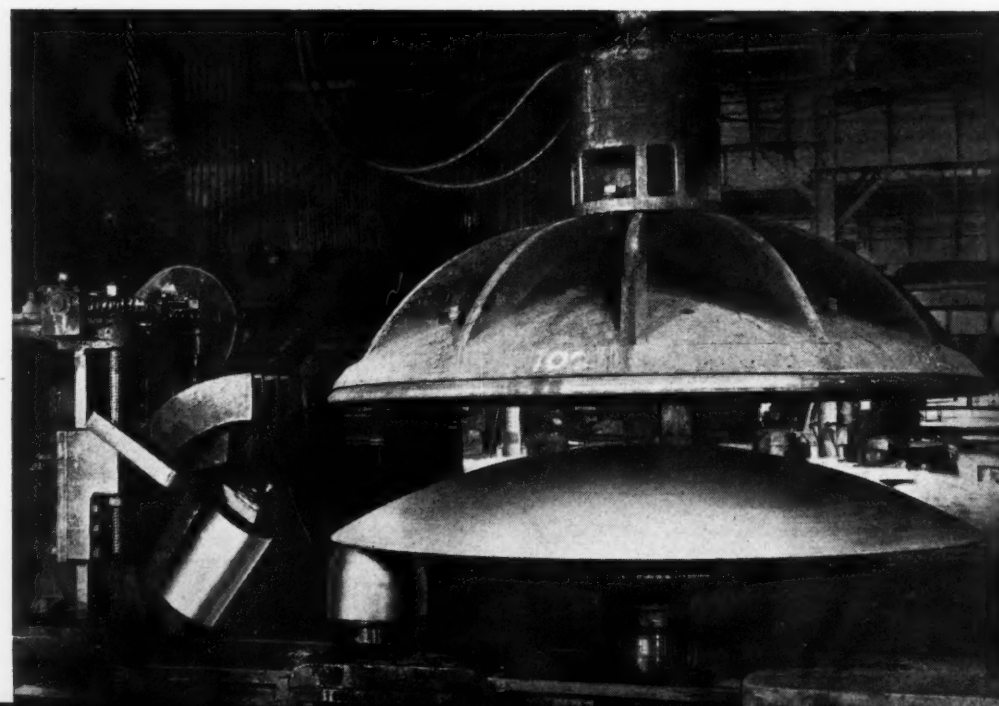


Fig. 5. Close-up View Showing Upper Former Mounted on Vertical Hydraulic Ram, Bottom Former Mounted on Spindle Jack, and the Inner and Outer Rollers



SPINNING

Fig. 6. First Spinning Operation, in which the Heated Disk is Compressed between Upper and Lower Formers

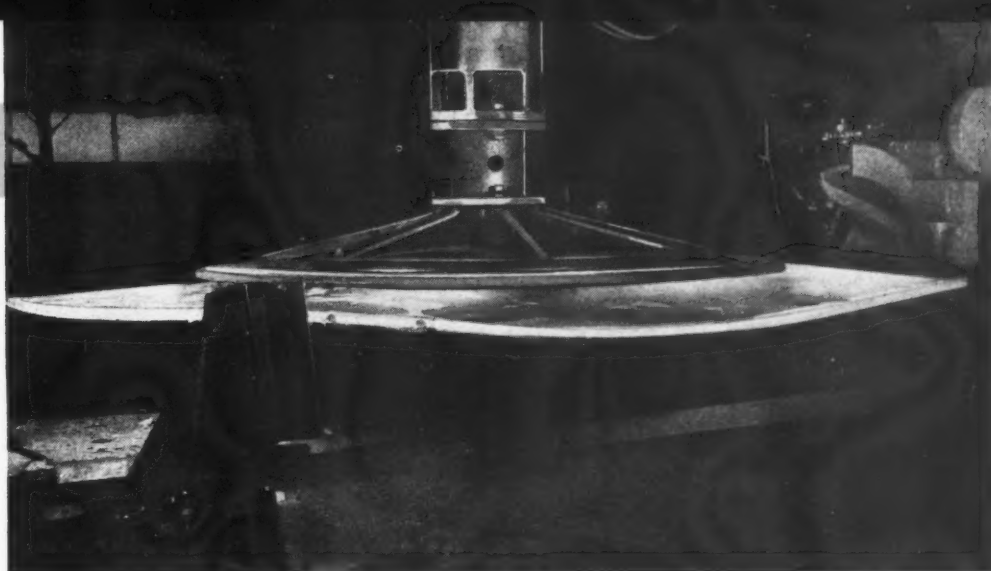


Fig. 7. Second Spinning Operation, in which the Outer Roller is Manipulated to Compress the Edge of the Disk to Conform with the Shape of the Inner Roller

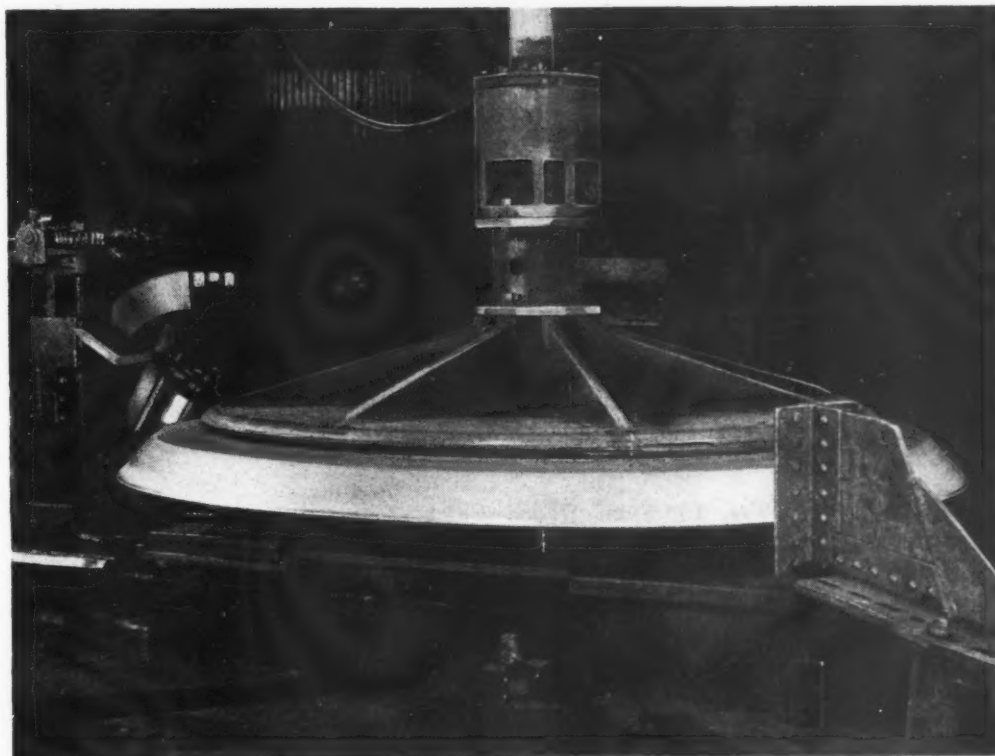
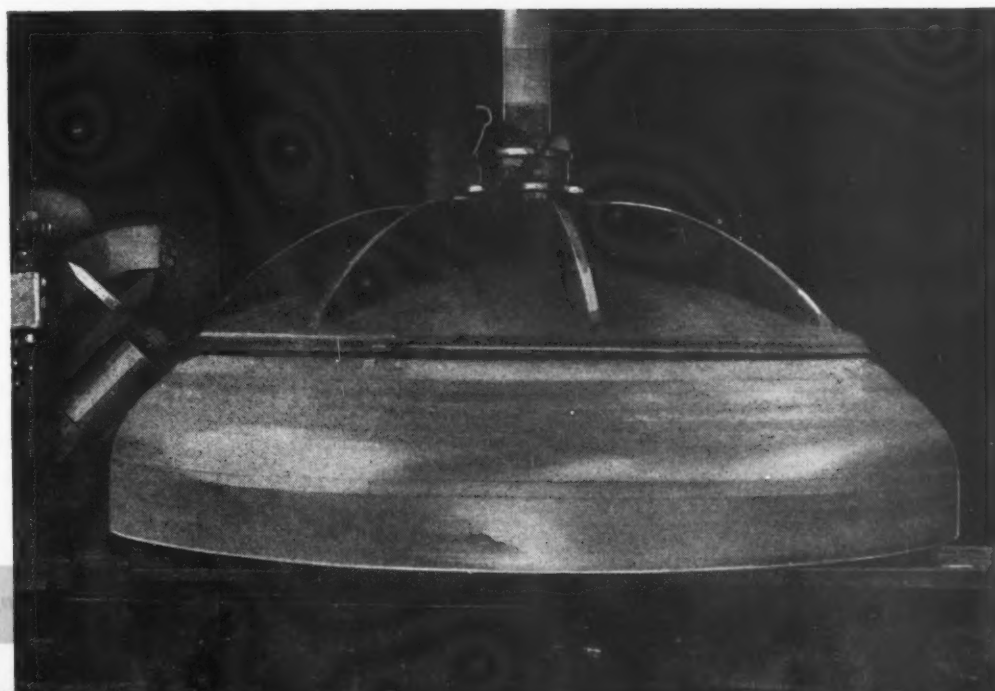


Fig. 8. An Elliptical Dished Head after Completion of the Spinning Operation. The Head is Now Removed from the Machine and Annealed in the Furnace



HOT-SPINNING

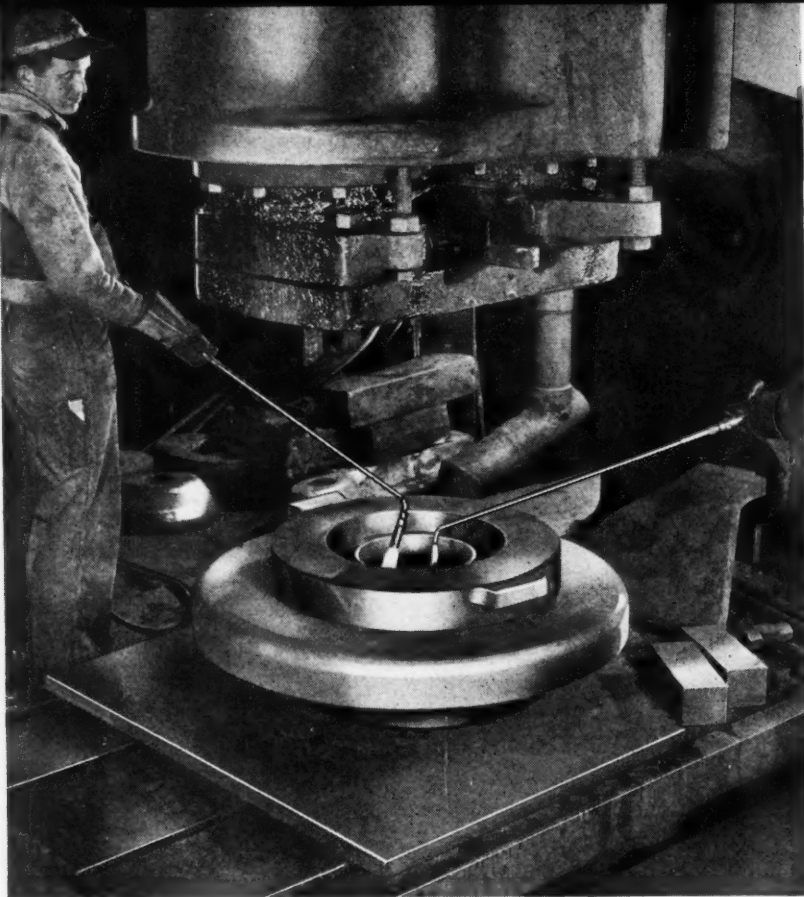
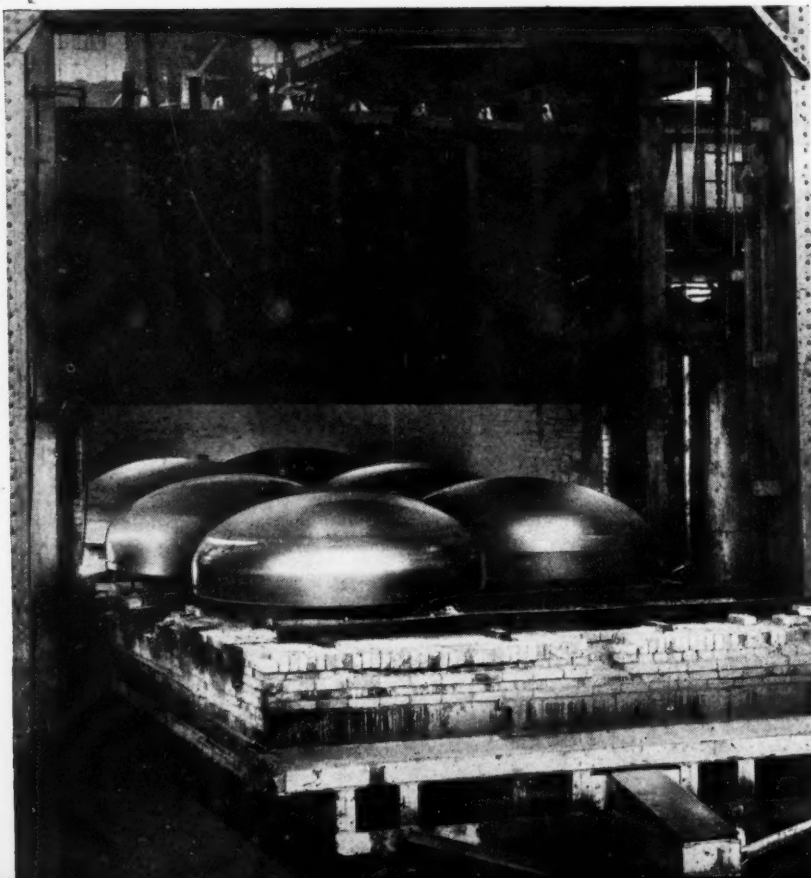


Fig. 9. A Completely Spun Head Being Locally Heated on a Hydraulic Press, prior to the Forming of a Flue-hole in the Head

Fig. 10. Spun Heads Entering the Annealing Furnace to Relieve the Stresses Caused by the Spinning Operation



local heating and sectional or progressive flanging. A charging machine, called a "peel" or "billie," is used to quickly remove the heated circle or head from the furnace and place it on the spinning machine.

Lukens spinning machines are of the vertical spindle type, similar in appearance to a four-post vertical press. The flat circular plate to be spun is held between the upper and lower formers, which have concave and convex shapes, respectively. The upper former is fastened to a vertical hydraulic ram by dowel-pins and bolts. The bottom former is bolted and keyed to a vertical spindle jack, which is turned at 20 or 46 R.P.M. by means of a gear train and electric motor. The hydraulic ram transmits pressure to the upper former, and thus to the head being spun. The pressure is adjustable from 0 to 166 tons.

The formers are made from cast iron, cast steel, or steel plates. The contours are sometimes machined, when necessitated by the tolerances specified for the finished head. A close-up view of one of the spinning machines is shown in Fig. 5.

The hydraulic centering mechanism consists of four vertical rolls, mounted on cast-iron supports that slide radially from the four corners toward the center of the machine. The rolls move simultaneously an equal amount, assuring accurate centering of the flat circular plate to be spun.

Mounted at one side of the base of the spinning machine are the carriage and saddle that hold the quadrant roller. This roller can be moved by motor-driven gears up and down, parallel to the axis of the spindle jack and ram; in and out—toward or away from the work; and through an arc of slightly less than 180 degrees, on a curved guide. The outer roller and the saddle on which it is mounted can be seen to the left in Fig. 5.

The outer roller is a straight-sided cylinder floating on a water-

HEAVY TANK HEADS

cooled bronze bearing, and is rotated by direct contact with the head being spun. The inner roller, which can be seen under the left-hand edge of the lower former in the illustration, is mounted on a separate screw-operated apron, and its position with respect to the work is adjustable. This inner roller, once adjusted to the position necessary for the size of head being spun, does not change its position. It has the shape of the inner corner radius and flange of the head being spun, and is also rotated by direct contact with the work. Both inner and outer rollers are of cast steel, and have a relatively short life.

In operation, the upper former is lowered, compressing the hot circular plate against the lower former, as shown in Fig. 6, and thus accomplishing the first step in obtaining the crown shape of the head. Usually two changes of formers are necessary to complete a head. The edge of the head is formed by the outer roller compressing the metal against the inner roller, as shown in Fig. 7. The completely spun elliptical dished head is shown mounted on the spinning machine in Fig. 8.

Rapid gaging is accomplished by means of a steel tape, which is clipped to the edge of the head, after stopping the spinning machine, and stretched around the circumference of the head. This tape, sometimes called a "hot tape," is compared with a cold tape in order to correct the measurement for expansion. Scale is removed from the head while spinning by centrifugal force and air blasts.

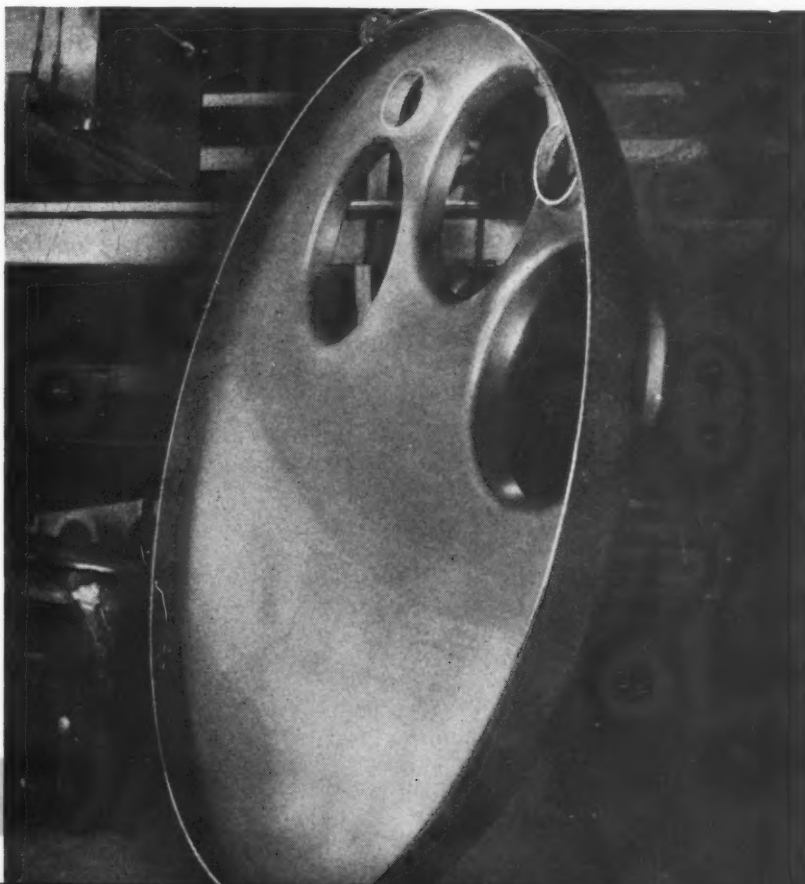
Spinning is nearing completion in the view of the elliptical dished head shown in the illustration on page 141. This head was spun from a flat circle 230 inches in diameter by $2 \frac{37}{64}$ inches thick, which was flame-cut from a plate made by welding together two plates, each 232 inches long by 116 inches wide by $2 \frac{37}{64}$ inches thick. Five trans-

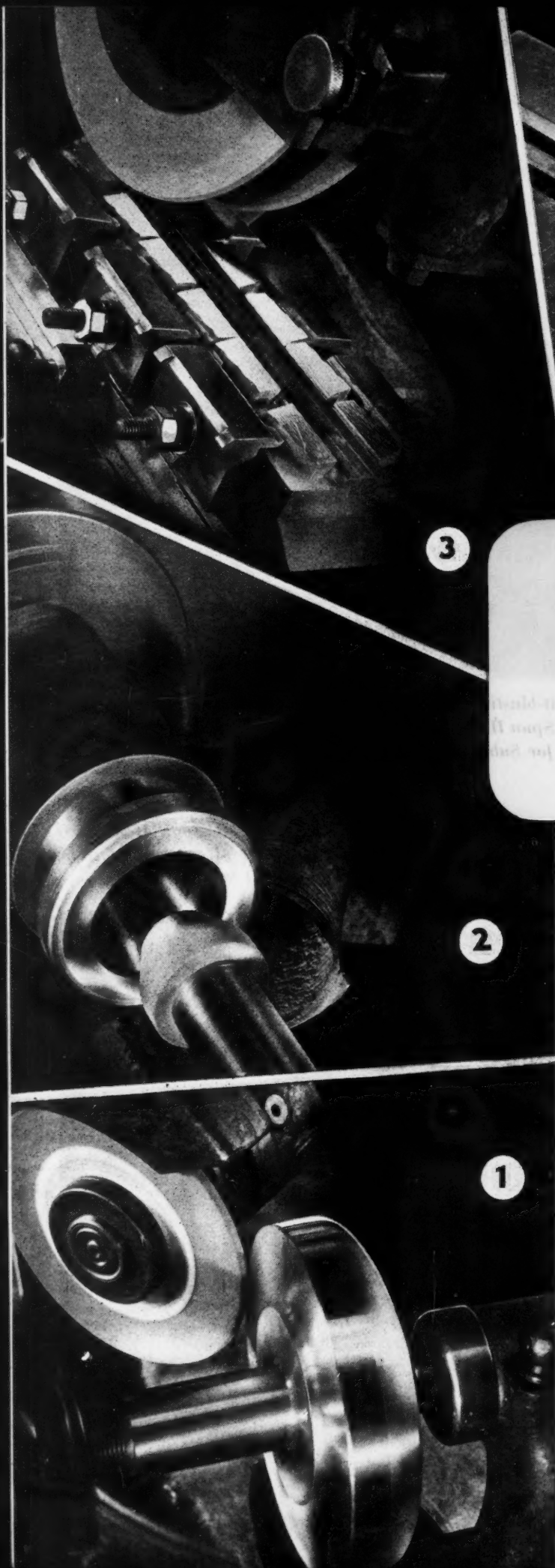
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Fig. 11. Grit-blasting Cleans and Smooths the Surfaces of Spun Heads, which is a Requirement for Subsequent Painting

Fig. 12. "Flanged-only" Head Spun from Two Thicknesses of Steel to Add Strength to Portion Containing Tube and Staybolt Holes





2

Grinding Operations Hastelloy

Photographs by Courtesy of the

Fig. 1. Stellite Rollers Used for Burnishing Railway Car Axles Must Have a Fine Smooth Finish Themselves in Order to Impart a High Polish to the Axles. This Illustration Shows One of the Finishing Operations on a Roller being Performed on a Universal Tool Grinder

Fig. 2. Form-grinding a Contour Tapered Hole, which has a Straight Section as Well, in a Forging of Hastelloy A. This Part is for an Injection Molding Machine Used in the Manufacture of Plastic Parts

Fig. 3. Serrations are Ground in Stellite Cutter Blades by the Use of a Double Fixture which is Indexed Sidewise after Each Serration is Completed. Approximately Twelve Passes are Required to Complete Each Serration in These Cutter Blades

Fig. 4. The Grinding of a Circular Forming Tool that is Employed in Machining a Spherical Seat Necessitates an Unusual Machine Set-up Involving the Use of Size Blocks

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on Stellite and Products

Haynes Stellite Co., Kokomo, Ind.

Fig. 5. Cylinder Heaters Used in Injection Molding Machines for the Manufacture of Plastic Parts are Made from Hastelloy A and Must be Ground to a High Finish. This Illustration Shows the Torpedo Part of a Heater being Ground

Fig. 6. Small Circular Passages through the Torpedo for a Heater on an Injection Molding Machine are Ground to a Smooth Finish by the Use of High-speed Portable Pneumatic Tools Equipped with Pencil Type Grinding Wheels

Fig. 7. Stellite Insert Blades for Milling Cutters are Ground while Retained in a Cast-iron Fixture Held on a Magnetic Chuck. Sometimes Non-magnetic Work is Held to the Magnetic Chuck by Pouring Molten Sulphur around the Blades, which are Supported by Outside and Inside Rings

Fig. 8. Risers and Gates are Ground from Hastelloy Castings by the Use of Floor Stand Grinders of Various Sizes, as Required by the Dimensions of the Work. A Large Pipe Fitting of Hastelloy Alloy is Shown being Ground

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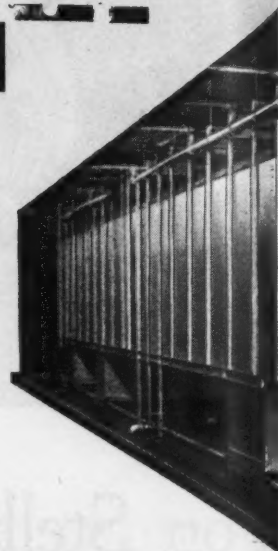
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How Ford Automobile Bodies Are Phosphate-Coated

The Excellent Durability of Phosphate-Coated Automobile Fenders during the War Period Led the Ford Motor Co. to Provide This Rust Protection to All Body Parts, Including Nuts and Bolts, of Ford and Mercury Cars

By CHARLES O. HERB



BEFORE the war, the Ford Motor Co. applied a phosphate rustproofing process only to fenders and wheels of Ford and Mercury automobiles. However, because of the excellent durability shown by these parts during the war period, the company has recently installed equipment for phosphate-coating the bodies, in addition to the fenders and wheels. Even valve springs, bolts, and nuts are being rustproofed by this process.

Phosphate causes a chemical reaction by means of which the surface of the steel is converted into a protective coating. The process really causes a chemical conversion of the metallic surface to a non-metallic coating composed of microscopic crystals that are integral with the metal. This crystalline coating provides a durable base for paint finishes and prevents corrosion of the underlying metal. In cases where paint is scratched through on a phosphate-coated body part or fender, only the exposed surface will rust, and corrosion will not creep under the paint, as in cases where the metal surface is not provided with such rustproofing.

Scratched automobile bodies that were phosphate-coated before the application of paint have been subjected to salt water spray for 2000 hours without any signs of corrosion except along the scratch. Scratched bodies that were not rustproofed before painting, and which were subjected to salt water

spray for 500 hours, showed extensive corrosion underneath the paint. The phosphate coating is not a conductor of electrical current and so it affords protection against electrochemical corrosion of the metal. Another big advantage derived from the practice of phosphate-coating is greatly improved paint adherence as a result of roughening of the steel surface. This roughening is almost imperceptible to the touch but nevertheless serves as an excellent paint bond. On Ford and Mercury bodies, the phosphate coating is 0.0001 inch thick.

Extensive equipment has been installed for coating the automobile bodies. It comprises a completely conveyORIZED line which eliminates the handling of heavy work as much as possible. Separate production lines have been installed for Ford and Mercury bodies. The Mercury line will be described here. One body goes through this line every two minutes. The Ford line handles one body every minute.

When the automobile bodies reach the starting end of the phosphate-coating line from the metal finishing department, they have been wiped with a light petroleum solvent to remove excessive amounts of grease and dirt remaining from the press operations. This preliminary cleaning step is desirable because, if only the cleaning facilities of the coating line were relied upon to remove heavy grease, the cleansing solutions would have to be so strong that chemicals would be carried into



the phosphate-coating solution, with considerable detriment to the equipment.

The first step in the coating process consists of conveying the bodies through an emulsion type cleaner unit equipped with a multiplicity of nozzles arranged for directing sprays all over the top and sides. The cleaner consists of 80 per cent kerosene plus an emulsifying agent and soap. The emulsion is used at a temperature of 160 degrees F. The bodies then pass through another similar cleaning unit, in which hot water at a temperature of 160 degrees F. is sprayed on them. The bodies next pass on to the phosphate-coating unit. The distance between the rinsing and the phosphate-coating units is sufficiently long so that all water has dripped from the bodies before they enter the coating unit.

In the heading illustration may be seen the starting end of the phosphate-coating installation. Sprays direct the solution on the bodies in the same way as the cleaning and rinsing sprays of the preceding units. The phosphate solution is maintained at a temperature of 130 degrees F. All tanks of the phosphate-coating unit are checked hourly to insure that the solution is maintained at the required strength, and Chem-O-Feeder pumps operate all the time to constantly replenish chemical as the solution is recirculated.

After a cold-water rinse in a spraying unit connected to the phosphate-coating equipment, the

bodies pass through a chromic-phosphoric acid sealer which is sprayed on the top, sides, and bottom of the bodies. This operation is performed in a continuation of the phosphate-coating unit, the entire unit being approximately 160 feet long.

At the end of this coating operation, the conveyor makes a right-angle turn to carry the automobile bodies through a tunnel of infra-red lamps, which is illustrated in Fig. 1. There are 1120 lamps in this tunnel and they produce a temperature of 320 degrees F. Each body is in the tunnel for a period of five minutes.

The bodies then enter a paint booth in which two coats of primer surfacer are sprayed on the top and sides of the bodies by men operating manual spray guns. The bodies then pass through the tunnel of infra-red lamps illustrated in Fig. 2, to the elevated spray booth seen in Fig. 3. As the bodies pass through this booth, the floor panel is sprayed with primer surfacer from underneath by a man located in the unit below the bodies. With this step, operations in the phosphate-coating line are completed and the bodies are ready for final painting.

The phosphate-coating line that has been here described was recently installed in the Rouge Plant. Similar installations will be made in the Ford branch plants which are located all over the country.

Fenders, panels, and similar parts of medium size are phosphate-coated by automatically dipping

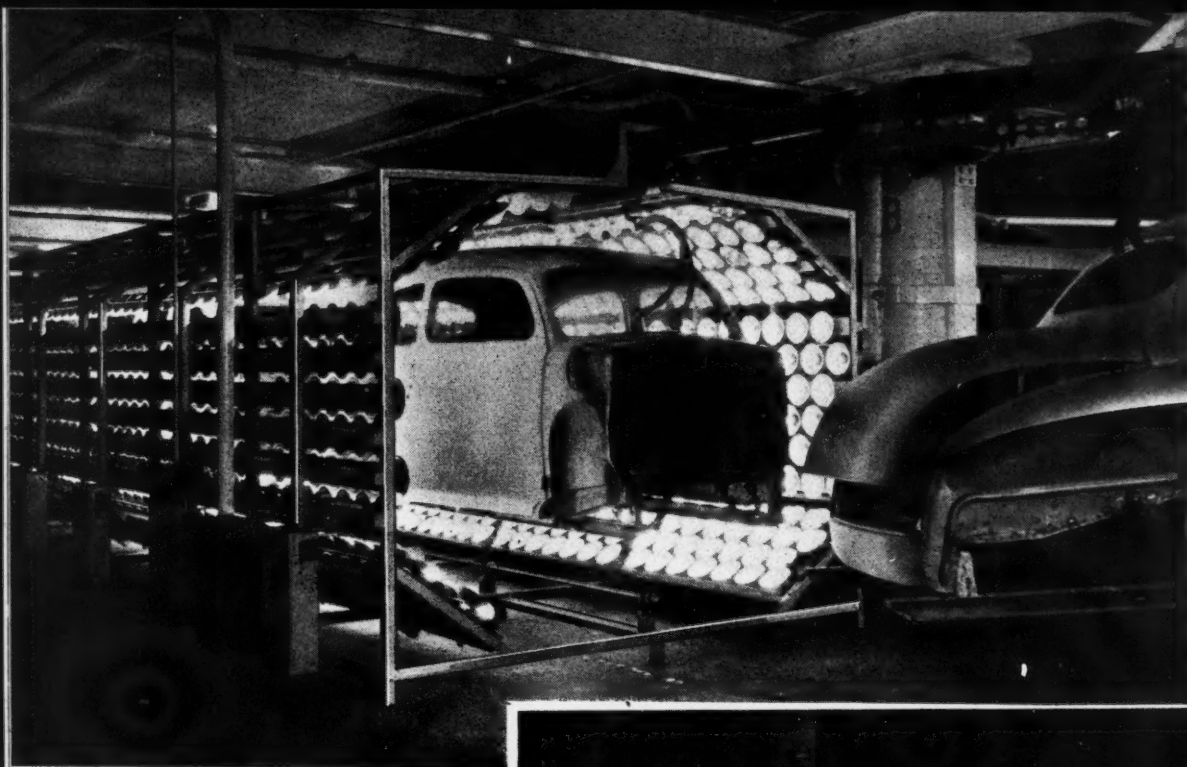


Fig. 1. (Above) The Tunnel of 1120 Infra-red Lamps through which the Bodies Pass at the End of the Phosphate-coating Line to Insure Thorough Drying of the Body before Application of the Primer Surfacer

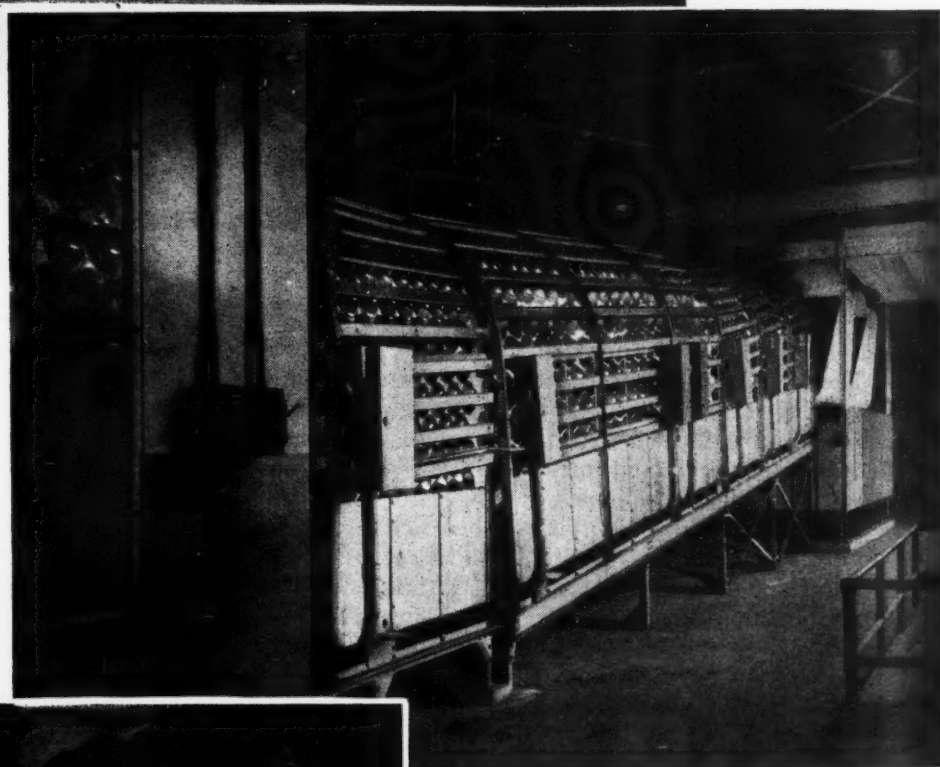


Fig. 2. (Above) Tunnel of Infra-red Drying Lamps which Extends from the End of the First Primer Painting Booth to the Elevated Booth in which the Floor Panels are Sprayed



Fig. 3. (Left) Elevated Booth in which the Floor Panels are Sprayed with Primer Surfacer from beneath

PHOSPHATE-COATING

Fig. 4. View of the Conveyor Line that Carries Fenders and Other Medium-sized Parts through a Phosphate-coating Tank that Contains 135,000 Gallons of Solution. Seventeen Thousand Fenders Alone are Coated in Each Eight-hour Shift



in a tank. For this operation, the parts are suspended on a conveyor, as shown in Fig. 4. They are first carried through an alkali wash, during which nozzles direct heavy sprays all over the parts. The solution is held at a temperature of between 190 and 200 degrees F. The parts are then carried between a second series of nozzles, in which solution from the first wash is used a second time. The parts are next subjected to hot-water sprays. Both vertical and cross sprays are employed in the three instances to insure thorough cleansing of the work from all grease and dirt.

From the washing operations, the parts are carried directly to what is believed to be one of the largest phosphate-dip tanks in the world. It is approximately 86 feet long by 33 1/2 feet wide by 10 feet deep and contains 135,000 gallons of solution. The conveyor passes back and forth a num-

ber of times over the tank so that each piece travels a distance of about 370 feet in the phosphate solution. The parts are in the tank a total of five and one-half minutes. This solution is held at a temperature of 210 degrees F.—sufficiently below the boiling point so as not to disturb the precipitate.

Following this dip, the parts are immersed for twenty seconds in a chromic acid tank in which the solution is held at a temperature of 200 degrees F. Then the parts are carried through a drying oven operated at a temperature of between 500 and 600 degrees F. The period of time in the oven is ninety seconds. The fenders are next inspected and distributed to local assembly lines or shipping docks. The conveyor used in this phosphate-coating set-up has a linear length of 1150 feet and the parts are on the conveyor for seventeen minutes. Seventeen thousand fenders are handled per eight-hour shift

Fig. 5. Starting End of the Unit Used for Phosphate-coating Bolts, Nuts, Washers, and Clips as They are Carried through the Process in Slowly Revolving Wire-mesh Barrels

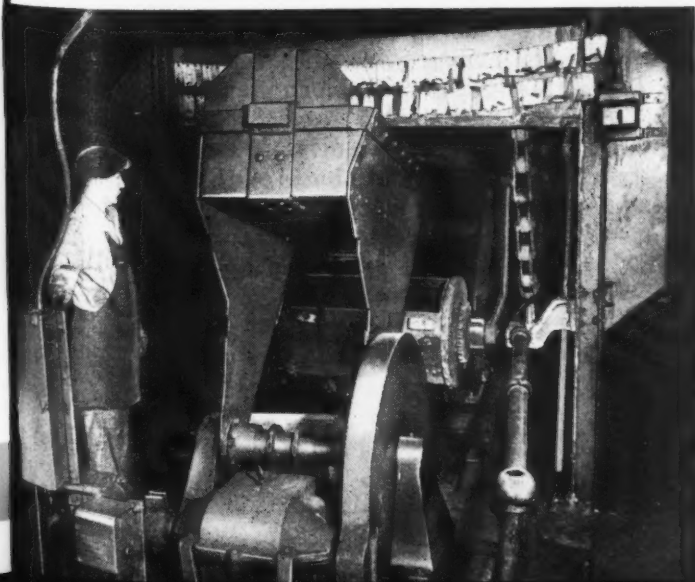


Fig. 6. Centrifuge at End of Line Employed for Phosphate-coating Small Parts, in which the Parts are Revolved for Thorough Drying and Sometimes for Coating with Oil



HOW FORD AUTOMOBILE BODIES ARE PHOSPHATE-COATED

and several thousand small parts in addition. The conveyor runs at a speed of 65 feet per minute.

Nuts, bolts, screws, washers, clips, etc., are carried through phosphate-coating equipment while loaded in wire-mesh barrels that are rotated constantly as they pass through the various tanks. Fig. 5 shows the starting end of this phosphate-coating line. Parts to be treated are first dumped into a scoop mounted on crank-arms that raise the scoop from floor level and tilt it, as illustrated, for emptying the contents into an open barrel.

The barrels are carried successively through an alkali precleaning tank, a hot-water rinse, a pickling tank containing a 10 to 12 per cent sulphuric acid solution, and a hot-water rinse. Then the barrels are immersed in a phosphate-dip tank and remain in this tank for forty-five minutes. The tumbling of the parts in the barrels insures uniform coating of all work-pieces.

When the barrels reach the discharge end of the unit, which is illustrated in Fig. 6, the baskets are emptied into a centrifuge built into the floor. The small parts are spun in this equipment until thoroughly dry. At the end of the operation, the phosphate coating is from 0.0002 to 0.0003 inch thick. Each barrel will hold about 800 pounds of parts and a barrel of work reaches the end of the line every five minutes. This means that approximately 19,000 pounds of these small parts are coated every two hours.

If the parts are to be oiled, the oil is poured into the centrifuge after the parts are dry, and then they are again rotated to insure a uniform coating of oil on each part. Work-pieces to be painted are taken from the centrifuge and run through an automatic painting unit. In this unit, the parts are first dipped in the paint and then carried through a long drying oven.

Industry is Asked to Assist Metal Scrap Movement

AN appeal to all metal-working industries for immediate help in relieving the acute shortage of iron and steel scrap is being made by the Committee on Iron and Steel Scrap of the American Iron and Steel Institute. In order to maintain high production levels, the steel industry needs every bit of scrap that it can obtain.

The stock piles of scrap at the steel mills are low through a combination of circumstances, including the crippling effect of recent strikes upon industrial operations. During the coal strike a larger percentage of scrap than normal was used in the furnace charges because there was no coal available to make pig iron. Consequently, an already low supply of scrap was brought to rock bottom. The strikes in consuming and fabricating industries, from which a large part of the scrap normally comes, also have cut that supply drastically. Furthermore, it was expected that there would be a considerable amount of battlefield scrap iron. Such scrap has not been returned in expected quantities, however, due to the chaotic conditions abroad.

Another reason for the low scrap supply is that many sources of scrap have had to hold on to materials that normally would have been scrapped. This was necessary because of the inability to get new materials and equipment. The railroads, for instance, cannot tear up their old tracks or scrap locomotives and cars until replacement rails and equipment are available. Even farmers cannot

scrap their antiquated equipment until they can get new. More automobiles would have been scrapped if it had been possible to get new cars and if repair parts were available so that old cars were not held simply as a supply of repair parts.

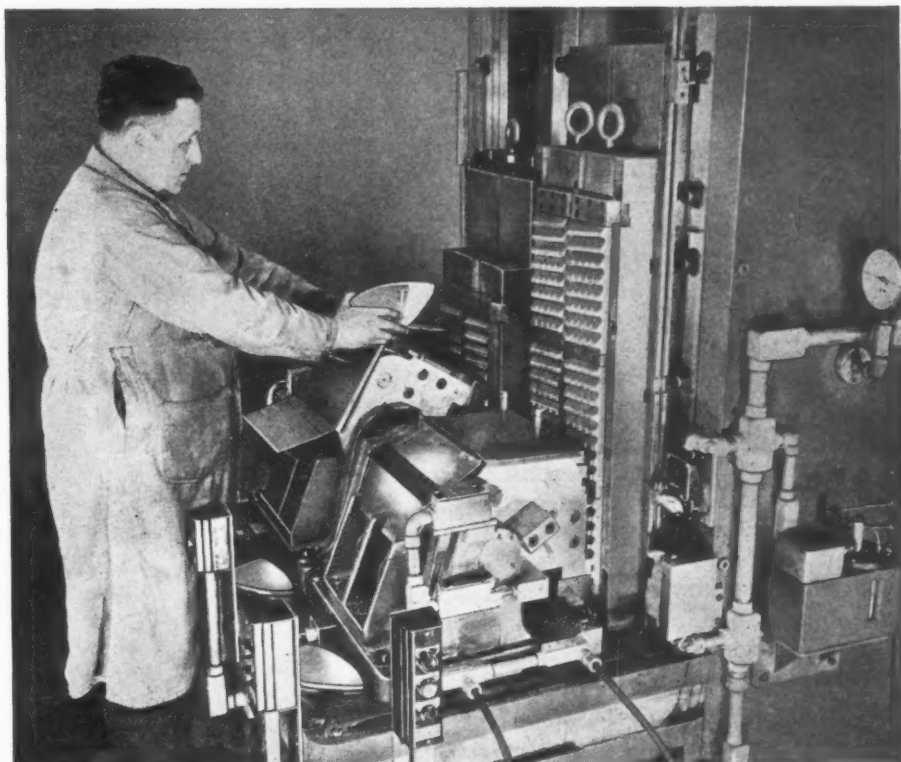
The seriousness of the situation may be understood from the fact that from twenty-five to thirty open hearth furnaces were idle at the beginning of August for lack of scrap, as against twelve idle for the same reason on July 1. Meanwhile, the July receipts of scrap by the steel mills fell from an average of 60 per cent of requirements to approximately 40 per cent of the requirements. Hence, everyone in the industry able to do so should put his shoulder to the wheel.

Both production scrap and dormant scrap are needed. The latter includes obsolete machinery, tools, jigs, dies, fixtures, etc., which are not likely to be of further use. Companies who wish to start a drive for gathering scrap—thereby indirectly helping themselves to get more new steel—are urged by the Committee to organize for this undertaking by appointing an executive to be in charge, with authority to make decisions, and to set up a salvage committee to survey company plants for untapped sources of dormant scrap. Wherever possible, scrap should be separated by types, putting iron scrap in one place and steel scrap in another. The material can then be moved promptly through the company's regular scrap dealers.

Broaching in Post-War Production

Broaching was Employed During the War Period to a Greater Extent than Ever Before in Order to Speed up Production. The Advantages of This Process are Now Being Applied in Manufacturing Many Peacetime Products Formerly Made by Other Methods

By O. W. BONNAFE
Research Engineer
The Lapointe Machine Tool Co.
Hudson, Mass.



GOOD finish with close tolerances, high production, long tool life, low cost per piece, the use of unskilled labor, savings in floor space, and reduced material waste are the primary reasons why the broaching process is being adapted to the manufacture of so many varied products.

Standard broaching machines can be used for a variety of different operations by the ingenious design of broach bars and fixtures. The adjustable length of stroke and cutting speed of most modern broaching machines permit the machining of many different sizes and shapes of work-pieces. Tiny carburetor jets, as well as massive machine tool frames, are being produced by the broaching process. Broaches have been made as small as 0.04687 inch in diameter, and as large as 14 inches in diameter by 100 inches long, weighing more than a ton.

Since the tooth of a broach is in contact with the work only during the time required for it to traverse the length of the surface being machined, broach teeth maintain their size and sharpness for long periods.

Broaches are commonly of the pull type. Push-broaches can be used for any operation performed by pull-broaches, but are usually restricted to jobs requiring the removal of only a small amount of

stock, as they must be shorter and stiffer than pull-broaches in order to withstand the ram pressure.

Broaches are made in solid, built-up, and inserted-tooth types. Solid broaches are machined, hardened, and ground from bar stock. The built-up type is used for the larger sizes of broaches or where frequent replacement is necessary. Tools of this type consist of ring broaches or broach shells mounted on an arbor. High-speed steel is used almost exclusively in the manufacture of broaches. The use of carbides was found to be of little advantage because of the low cutting speeds used in broaching. Heat-treated materials as hard as 450 Brinell have been successfully broached with high-speed steel cutters.

A typical example of the effectiveness of broaching is its adaptation to the production of close-grained cast-iron, electric flat-iron sole-plates having a Brinell hardness of from 230 to 250. Formerly finished by milling and grinding, the production has now been increased by 300 per cent. Approximately 1/16 inch is removed from both top and bottom surfaces of the sole-plates, which are 7 inches long by 4 inches wide by 5/16 inch thick. A production of 220 finished pieces per hour is attained, keeping the surfaces within 50 micro-inch finish,

BROACHING

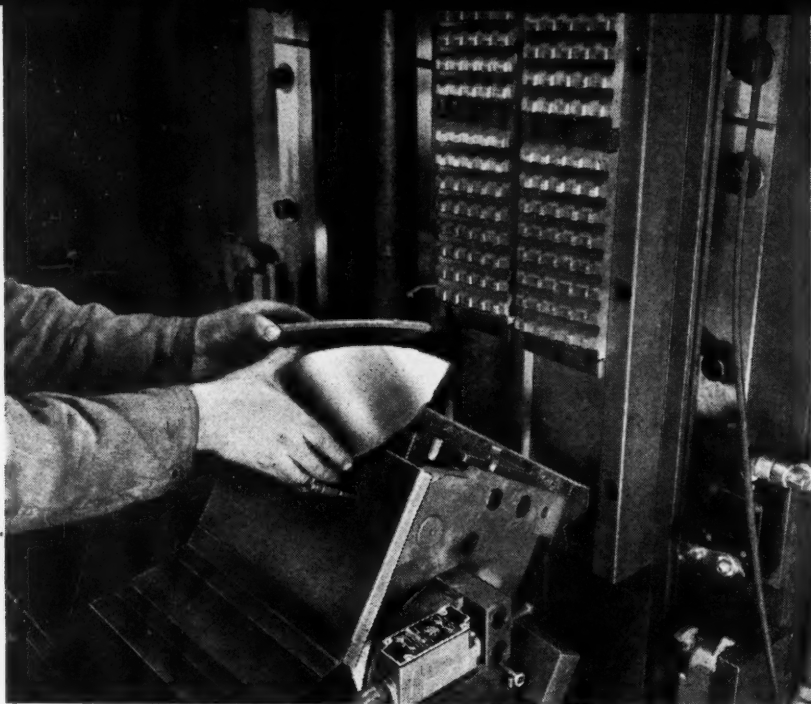


Fig. 1. (Left) Two Electric Flat-iron Sole-plates being Loaded into the Tilting Fixture of the Broaching Machine. Two Plates in the Other Fixture have been Broached and will be Unloaded, as Seen in Heading Illustration

Fig. 2. (Right) End Frames of a Loom have their Bearing Surfaces Broached by Means of a Hydraulic and Electronically Controlled Fixture which is Mounted on a Standard 15-ton Broaching Machine

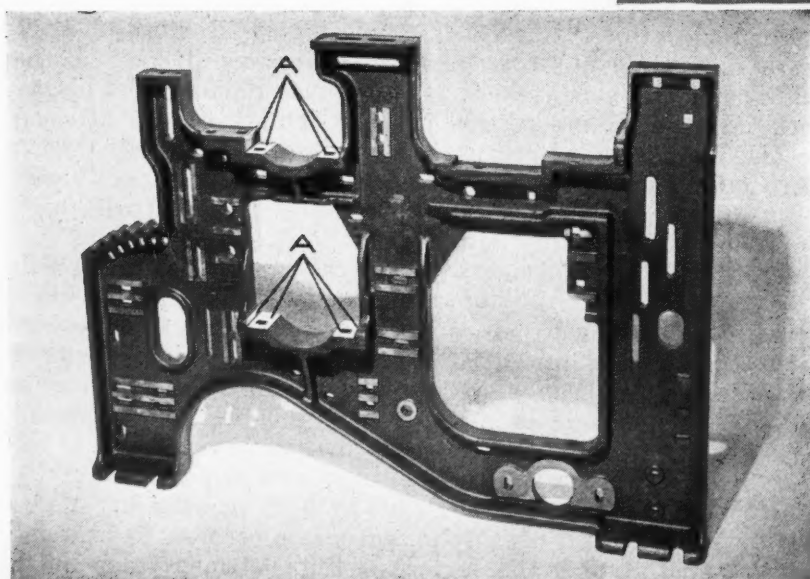
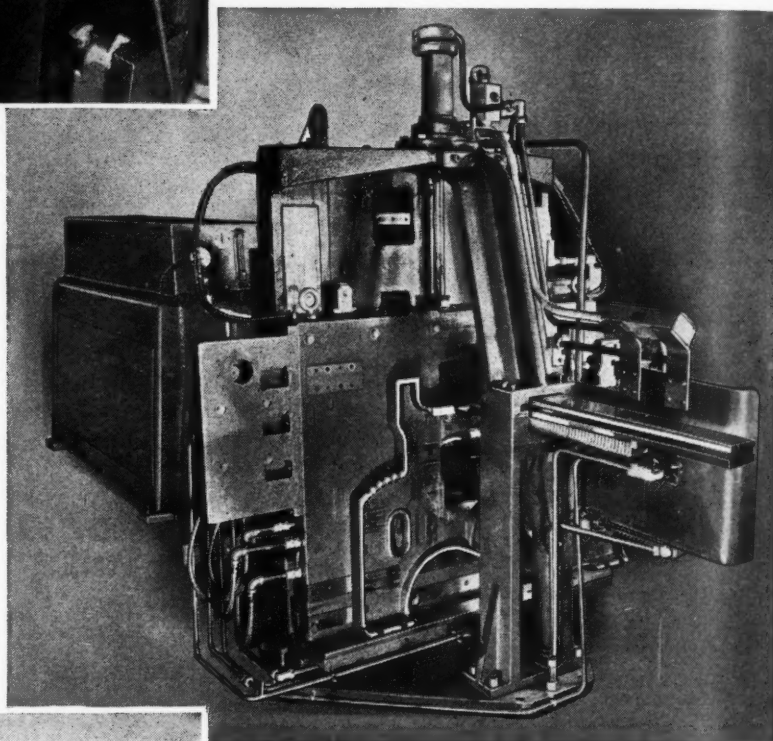
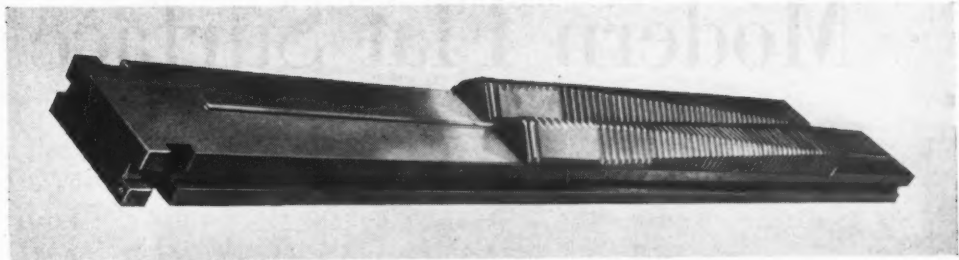


Fig. 3. (Left) The Eight Surfaces A of This Left-hand Loom Frame are Broached by Means of the Set-up Illustrated in Fig. 2, Employing the Broach Bar Seen in Fig. 4

Fig. 4. Broach Bar Used in the Set-up Shown in Fig. 2, Consisting of a Right- and Left-hand Broach Mounted in a Common Holder



and flat within 0.005 inch on green castings, at a saving of two-thirds of the former machining cost.

These sole-plates are broached on a standard Lapointe Model DRV, 15-ton, double-ram, vertical, hydraulic machine having a 66-inch stroke, as shown in the heading illustration. The work is clamped along the center of its narrow edges on an ingenious tilting fixture. Two fixtures, holding two sole-plates each, are used. One fixture is tipped up for loading while the other is in the machining position, with the sole-plates parallel to the broaches. Each ram carries two sectional type slab broaches, so that the two sole-plates are completely machined on both sides at each cycle.

The machine cycle consists of one stroke for each ram of the machine. The twin rams are hydraulically synchronized and counterbalanced, allowing the operator to load, broach, or unload both stations of the machine without moving from his position. The rams are operated at a speed of 16 feet per minute, which is limited by the time required for loading and unloading the fixtures.

Each sectional type slab broach consists of four blades or sections. The broaches are 4 1/2 inches wide, which allows 1/4 inch overhang on each side of the sole-plate. Each of the four sections has eight rows of teeth. The bottom section of the broach has each row of teeth ground to form five blunt vees, as shown in Fig. 1. The height of the teeth in the eight rows of this section increases progressively, and the top row of this section cuts a small segment of the sole-plate to the required depth. The teeth in the next three sections are all the same height, but each tooth in progressive rows is increased in width until the top row in the fourth section is a continuous tooth.

The central portion of the teeth in the top three sections does not cut. Stock is thus removed by narrow deep cuts in parallel portions, which allows the tool to remain sharp for longer periods. This type of broach cuts under scale, sand, or other hard surfaces, thus removing more stock with less pull and without dulling the teeth.

An ingenious adaptation of broaching is shown in Fig. 2. Here sixteen surfaces of both the right- and left-hand cast-iron frames of a cloth weaving loom, such as shown in Fig. 3, are broached in two simple set-ups. The surfaces broached, which are shown at A, hold ball-bearing pillow blocks. Shafts are mounted in these pillow blocks, and due to the alignment required and the fact that there is a gear train between the shafts, the total tolerance between the horizontal surfaces must be held within

0.001 inch. Vertical surfaces must also be held within a tolerance of 0.001 inch.

Broaching of the eight surfaces on each frame is accomplished with one right-hand and one left-hand broach mounted on a common holder, as shown in Fig. 4. This holder is fastened to the single horizontal ram of the broaching machine. The hydraulic and electronically controlled fixture automatically clamps the work and shifts the loom frame horizontally and vertically, so that the four sets of surfaces to be broached are consecutively brought into contact with either the right- or left-hand broach.

This is accomplished by two cam-plates and three hydraulic cylinders, which move the fixture 13 inches vertically and 3 inches horizontally to align the end of the loom frame with the broach. To broach the matching right- or left-hand frame, it is only necessary to change the loom frame and the cam-plates on the fixture.

The frames that form the ends of the loom come to the broaching machine with the edges milled to facilitate accurate location on the fixture. Each surface broached has approximately 1/8 inch removed from it by one stroke of the ram. The broaching is done on a standard Lapointe Model HP-30, 15-ton, single-ram, horizontal, hydraulic machine. The ram is operated at 25 feet per minute. Both broaches are about 1 1/2 inches square, and have three sections, each 12 inches long.

* * *

Federal Products Corporation Sponsors Quality Control Conferences

The first of two conferences on quality control and allied topics was held at the Providence, R. I., plant of the Federal Products Corporation August 13 to 16. A second conference is planned for September 10 to 13. Members of the sales engineering staffs of the Pratt & Whitney Co., West Hartford, Conn., and the Taft-Peirce Mfg. Co., Woonsocket, R. I., are collaborating in these conferences, as well as engineers of several other companies. The purpose of these meetings is to promote authoritative discussion of the subject of quality control, so vitally related to the needs of industrial production now and in the immediate future. A section of the program will be devoted to gage design. Gaging by various mechanical, indicating, electric, electronic, and pneumatic methods will be demonstrated as applied to practical shop work.

Modern Flat Surface Grinding



Fig. 1. Grinding Cast-iron Foundry Flasks by the "Free-hand" Method on a Disk Grinder

MANY grinding jobs can best be done with a wheel having a flat abrasive surface of large area, such as is presented by the side of a straight Type 1 wheel. However, such a wheel is mounted to grind with its periphery, and it is dangerous to grind on its side, since the wheel, not being supported to withstand sidewise thrust, is likely to break.

To secure the advantages without the risk, straight wheels can be mounted on steel plates by the use of sulphur or other cement or by bolts. They are then called "disk wheels," and the operation

performed with these wheels is known as "disk grinding." It is a high-production process suitable for such work as snagging castings or forgings. It is possible, on machines of proper design, to grind to tolerances as small as 0.0004 inch for size, 0.0001 inch for parallelism, 0.0002 inch for flatness, and 0.0001 inch for squareness; but in ordinary practice, it is customary to hold size and parallelism within limits of 0.001 to 0.005 inch.

The higher accuracies are often attained by mounting on disk machines the cylinder wheels which are used on some types of regular surface grinding machines, such as those described in the second article of this series in June MACHINERY. Also, when heavy metal removal is necessary, segments mounted in chucks may be used. Both of these methods, when used on disk grinding machines, are commonly, although erroneously, called "disk grinding." As a matter of fact, the difference between a disk wheel and a cylinder wheel is the dimension of the hole, and sometimes the thickness of the wheel. A typical disk wheel might be 20 inches in diameter by 1 inch thick, with a 6-inch center hole; while a typical cylinder wheel would be 20 inches in diameter by 4 inches thick, with a 14-inch center hole. In this article, only true disk grinding will be discussed.

For the rough-grinding of parts



Fig. 2. Grinding Two Sides of a Blower Housing, Using a Fixture for the Second Operation

Practice

By J. C. ARNDT and W. S. HALLOWELL
Simonds Abrasive Co., Philadelphia, Pa.

that need not be held to close limits, vertical-spindle grinders of the "rubbing bed" type are effective. Typical parts ground on such machines are gear covers, foundry flasks, stove doors, bases, and various housings. The wheels used are commonly of the sectional bolted-on type, which are sometimes as large as 72 inches in diameter. Parts can often be ground "free-hand" on these machines in less time than they could be placed in a fixture in other types of surface grinders.

The Hanchett machine shown in Fig. 1 is grinding cast-iron foundry flasks flat, with no regard to dimensions. In Fig. 2 is a Gardner machine of the same type equipped with a fixture designed to permit the two sides of a part to be ground parallel and square within 0.006 to 0.008 inch. The blower housing shown is first ground free-hand on one side, and then located from this side in the fixture for grinding the other side. The fixture is mounted on a swinging work-table.

Single horizontal-spindle disk grinders come in a variety of sizes and styles. Small bench and floor machines are used for sharpening tools that it is undesirable to grind concave; for squaring the ends of die-blocks; and for light snagging and other off-hand jobs. The two wheels, one mounted at each end of the spindle, may be of different specifications, which makes it possible to rough- and finish-grind on the same machine. These disk grinders are equipped with various types of work-holding and work-feeding devices to meet specific needs. The work may be held on a table that is adjustable for position and angle. Work-holding fixtures may be attached to the table, and there may be hand or mechanical feed.

The Gardner disk grinder shown in Fig. 3 has two universal lever-feed tables, each of which carries a special fixture. The one to the right holds a gear-case which is ground on one end at the rate of thirty to forty pieces per hour. The left-hand table has an indexing fixture for a larger gear-case, both ends of which must be ground to a tolerance of 0.005 inch for length and squareness. Fifteen cases per hour are ground. Hand-operated disk grinders of this general type are most

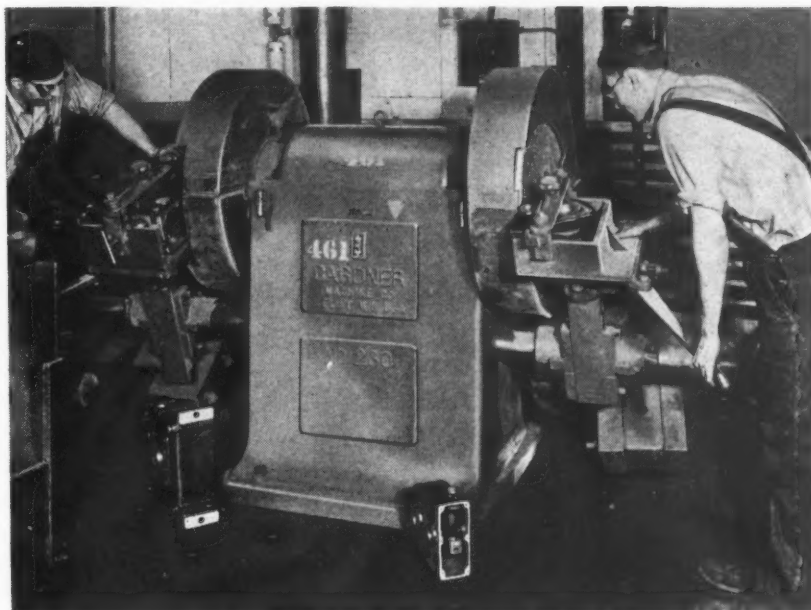


Fig. 3. Disk Grinder with Two Universal Lever-feed Tables, Each Carrying a Special Fixture

suitable for jobs that come along only occasionally and do not require large production.

Since it is necessary for the work to move constantly across the face of a disk wheel to insure uniform wear, some of the larger machines are equipped with mechanical oscillating devices. On ordinary single-spindle grinders, the operator moves the work by hand. The Gardner machine shown in Fig. 4 is equipped with a mechanical oscillating device which eliminates practically all of the manual effort, except loading and unloading, making production more regular, and, because of

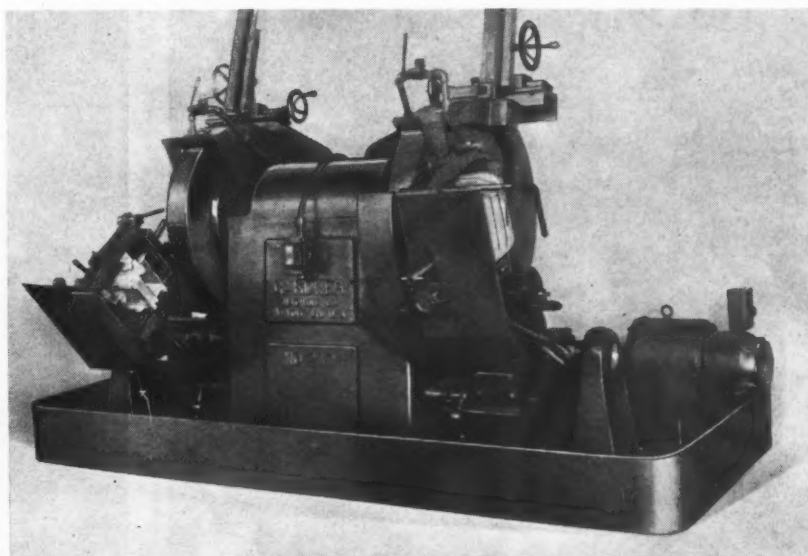


Fig. 4. Grinder Equipped with an Oscillating Device which Practically Eliminates All Manual Effort

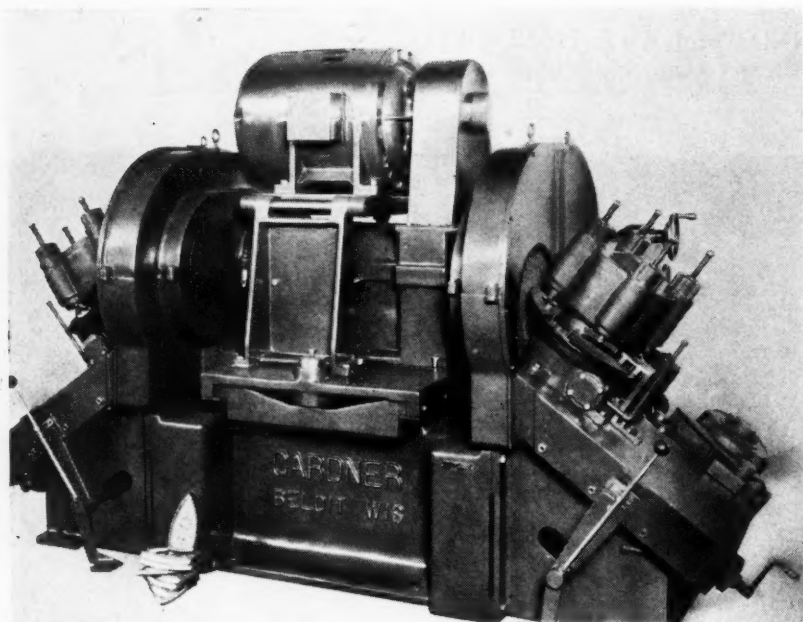


Fig. 5. Grinder Especially Built for Grinding the Beveled Edges of Sad-iron Sole Plates on a High-production Basis

beveled edges of sad-iron sole plates. Knee-mounted fixture slides are set at the angle to which the edge of the sole plates must be ground. They are of the spring-compensated, cam-clamping type, and are driven by individual motors. Instead of oscillating the fixture to secure even abrasive wear, the entire grinding head with its motor is mounted on a reciprocating slide. The parts are loaded by hand, and unloaded by a stripping device. Roughing and finishing cuts are needed, $1/32$ inch of stock being removed in the first cut, and from 0.010 to 0.012 inch in the second. The production is 150 pieces

an hour per operator.

lessened operator fatigue, much greater than that which could be obtained on a similar machine not so equipped.

The job shown is an aluminum evaporator coil. From $1/16$ to $1/8$ inch of metal is removed from the bottom. Each end of the machine is tended by an operator; the production per operator is sixty pieces an hour. Tolerances are not severe, the flatness being held to only $1/64$ inch.

Special single-spindle, two-disk grinders are often designed to do operations on a high-production basis. An example is the Gardner machine shown in Fig. 5, which was developed to grind the

an hour per operator.

The Hanchett single-spindle, double-disk machine shown in Fig. 8 has special power-operated drum type fixtures, one on each end, with twenty stations each. Stamped steel levers, $1/16$ inch by 2 inches, have the bottom edge ground in relation to the pivot hole and contact point. The production is about forty per minute.

Single-spindle, single-disk machines of the semi-automatic type have wide applications. The Gardner machine shown in Fig. 6 uses a rotary carrier with V-block stations and a chain hold-down mechanism for grinding the nose of 20-millimeter shells. The

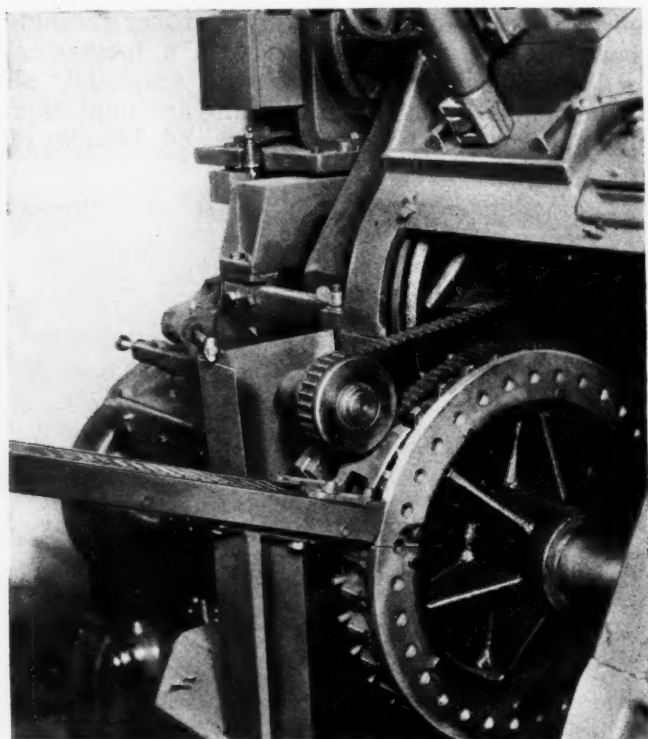


Fig. 6. A Rotary Carrier with V-block Stations and a Chain Hold-down Mechanism for Grinding Shells

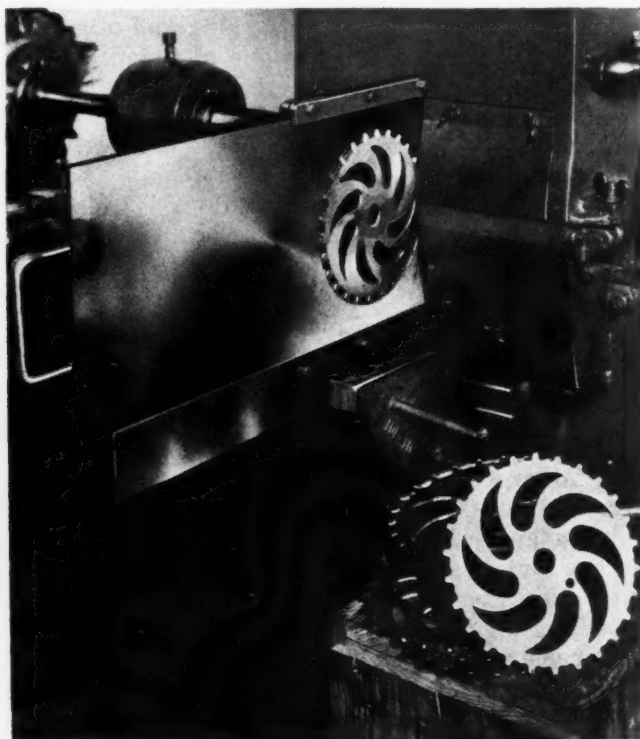
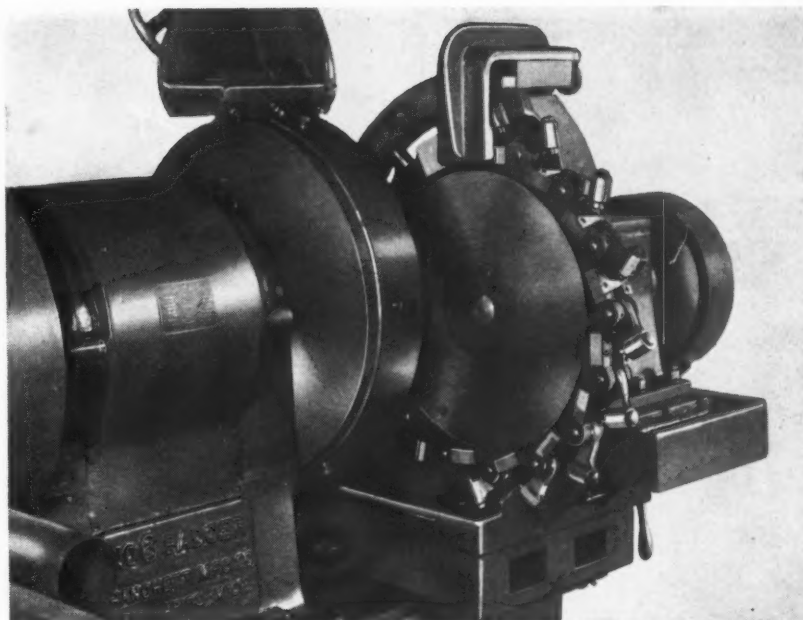


Fig. 7. Simple "Gun Type" Sliding Fixture for Grinding Bicycle Sprockets Preparatory to Plating

Fig. 8. Single-spindle, Double-disk Machine with Power-operated Drum Type Fixtures, One at Each End



production is from thirty to thirty-five per minute.

The same machine equipped with an eight-station fixture is shown in Fig. 11. The operation consists of finish-grinding connecting-rods and caps after milling. The fixtures are of the cam-clamping type, alternate stations being for caps and rods. Loading and unloading are done by hand. From 0.010 to 0.015 inch of stock is removed; the parts are held to 0.002 inch for size, and 0.0005 inch for flatness; the production is six to eight surfaces per minute.

Parts that have parallel sides to be ground to reasonable tolerances in quantity can usually be handled to best advantage on one of the various types of two-spindle machines equipped with two wheels mounted face to face, so that both sides can be ground at once. These machines are very versatile. Several types of feed are available—from simple hand-operated devices to fully automatic ones. The feed may be straight-line or rotary, and the parts may be loose in the fixture to permit floating, or clamped to maintain their position between the wheels.

Hand-feed disk grinders are often used for odd-shaped parts, for higher than ordinary accuracy,

and for exceptionally heavy stock removal. Fig. 7 shows one of the simplest types of hand-feed fixtures on a Gardner machine. It is a "gun type" sliding fixture in which bicycle sprockets are prepared for plating. The stock removal is 0.015 inch, and the production 120 per hour.

The 30-inch double-spindle Gardner grinder shown in Fig. 12 is equipped with a special indexing fixture for grinding the ends of large coil springs. The fixture is mounted on a hydraulic knee. One spring is held on the right-hand end while another spring is being ground. The fixture



Fig. 9. Grinder having a "Push-through" Fixture with which Malleable-iron Nuts are Fed through Machine by Hand

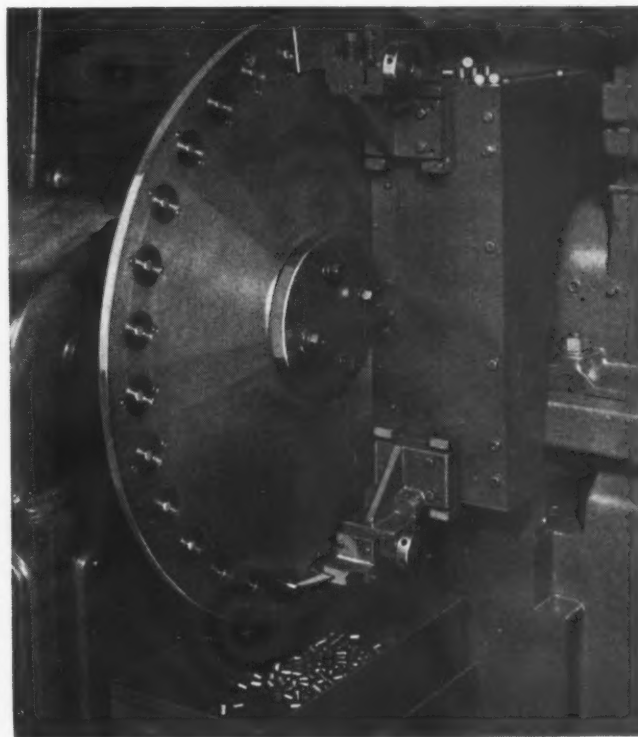
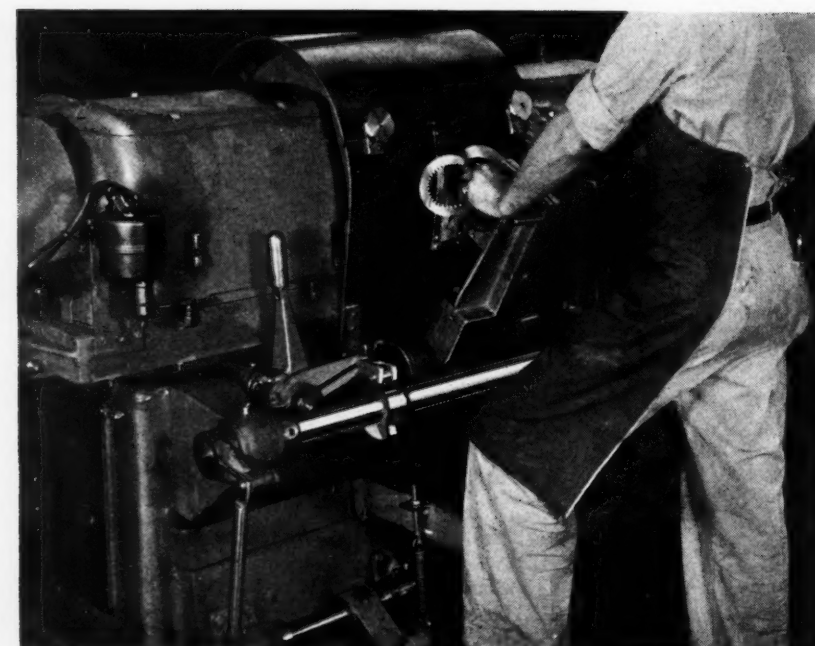
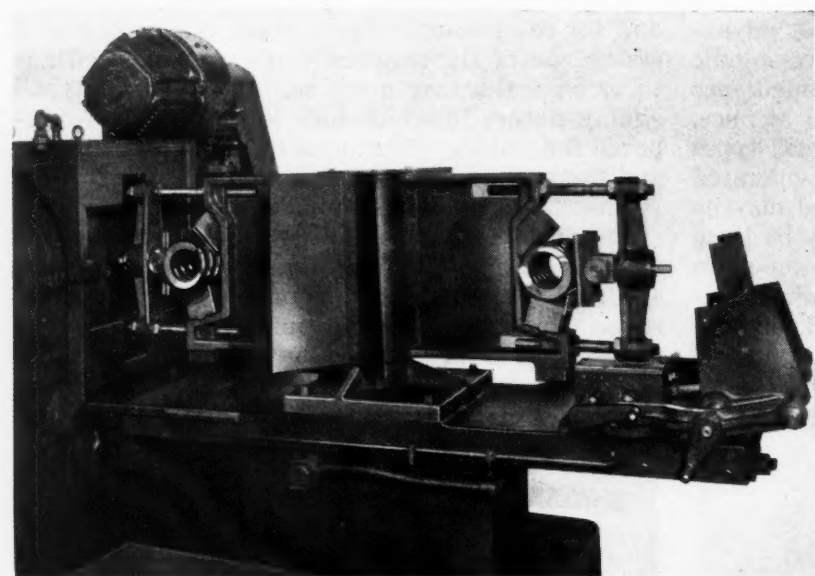
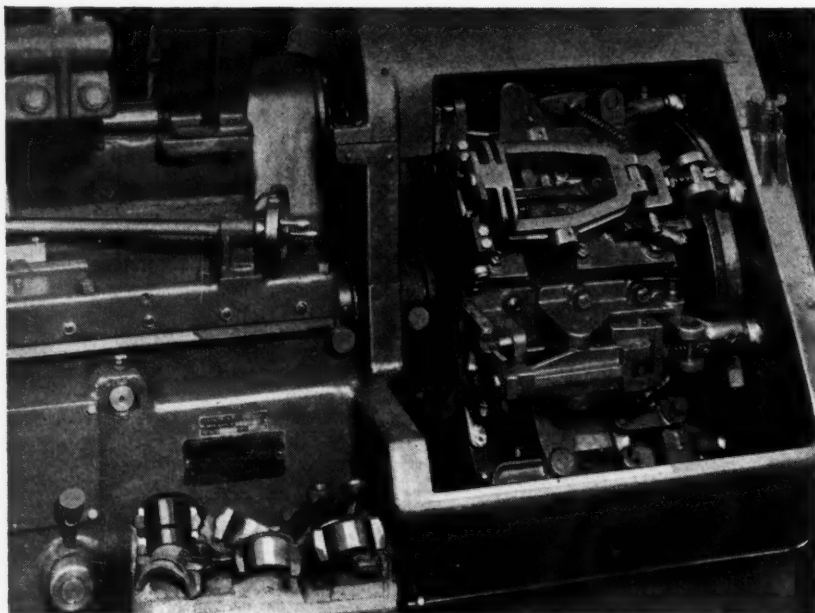


Fig. 10. A Rotary Fixture which Holds Roller-bearing Rolls in Hardened and Ground Liner Bushings for Grinding Both Ends



is then indexed to bring the right-hand spring into the grinding position. The springs are centered in the fixture by a hand-operated locating device, and are also clamped by hand. The tolerances are large—plus or minus $1/32$ inch for length and within $1/16$ inch per foot of length for squareness. The production is from twenty to twenty-five per hour, which is good considering the size of the springs—12-inch outside diameter by $1\ 1/8$ -inch wire.

The Gardner machine shown in Fig. 9 is equipped with a simple "push-through" fixture with which malleable-iron clamping nuts are fed through the machine by hand in a constant stream. The production is from twenty to thirty per minute, tolerances of 0.002 inch for flatness, 0.004 inch for parallelism, and 0.010 inch for size being maintained.

As in other types of disk grinding, it is often desirable to provide an oscillating motion for double-spindle grinders. This is done on the Hanchett disk grinder seen in Fig. 13. The operation consists of grinding the sides parallel on 4-inch outside diameter bronze friction rings. The fixture has a workholding plate 0.040 inch thick with a hole a trifle larger than the outside diameter of the ring, in which the ring is placed by hand. The operator opens the grinding head about 0.008 inch with the foot-treadle, and moves the piece between the wheels. Releasing the treadle allows the wheels to bear on the sides of the ring, which imparts a spinning or oscillating motion. This gives an accuracy of 0.0003 inch for both parallelism and size at a production rate of 100 per hour.

Fig. 11. (Top) A Single-spindle, Single-disk Machine of the Semi-automatic Type Provided with an Eight-station Rotary Fixture

Fig. 12. (Center) Thirty-inch Double-disk Grinder having a Special Indexing Fixture for Grinding Ends of Large Coil Springs

Fig. 13. (Bottom) A Double-spindle Disk Grinder with Provision for Oscillating Motion of the Work

An effective type of feed for strips, bars, and many sorts of small parts utilizes vertical rolls of steel or rubber. The rolls push the small parts across the center of the disks in a steady stream. When grinding strips or bars, the rolls pull the material through. The Gardner machine in Fig. 14 uses this device for feeding 3-inch diameter tapered bearing cones. The rolls, which are plainly visible, are of rubber. The cones are supported during grinding on steel guide bars which extend clear through the machine. The stock removal is 0.010 inch, and the production rate is sixty to seventy-five parts per minute, with tolerances of 0.0003 inch for parallelism and 0.004 inch for size.

Fig. 15 shows a Hanchett roll-feed disk grinder with one wheel removed to show the details of the roll-feed mechanism. The parts to be ground are ball-bearing races. They are loaded in a magazine, and the operation is wholly automatic. Similar machines are used for piston-rings.

Probably the most widely used type of fixture for double-disk grinding is some variant of the rotary feed, using a circular drum or plate fixture designed to fit the particular job. The work may be held loosely or clamped, and may be fed by hand or automatically. The simplest rotary fixtures are essentially merely perforated disks. The rotary fixture on the Gardner machine in Fig. 10 holds 5/8-inch diameter roller-bearing rolls in hardened and ground liner bushings. Both ends are ground at a rate of from thirty to forty per minute, the tolerances being from 0.0001 to 0.0003 inch for squareness and parallelism and plus or

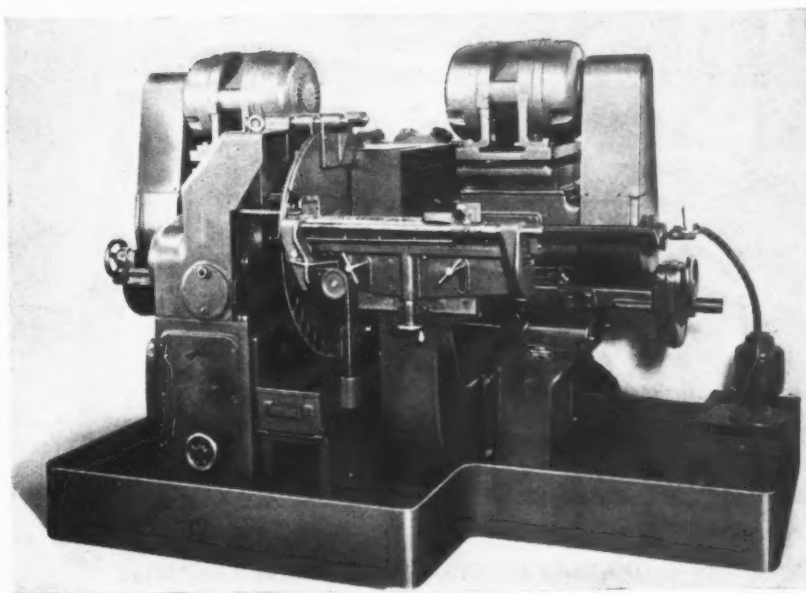
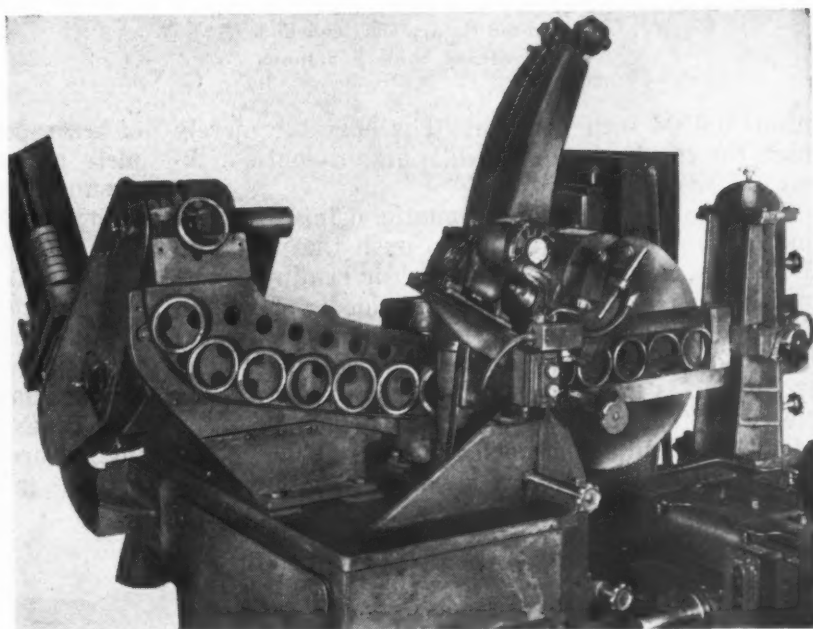
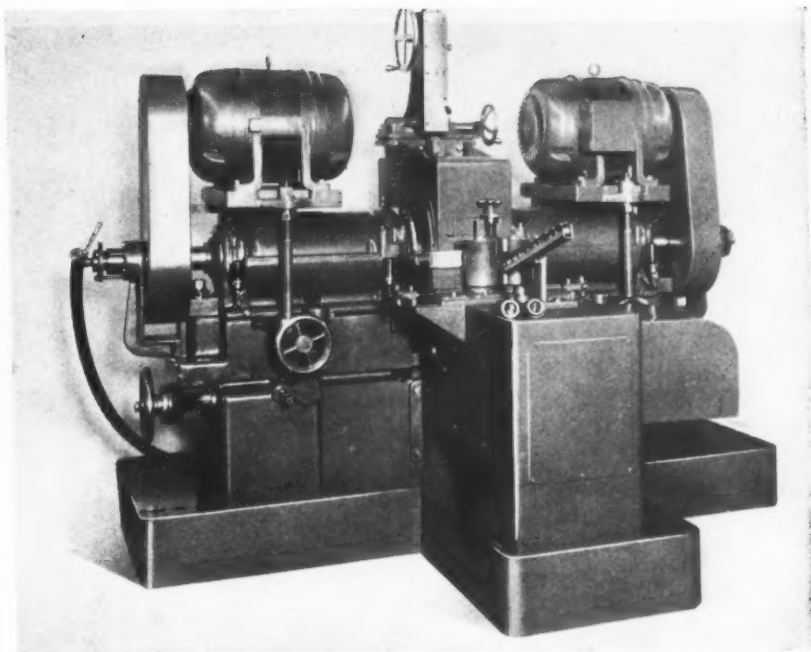


Fig. 14. (Top) Disk Grinder with a Device for Feeding 3-inch Diameter Tapered Bearing Cones by Means of Vertical Rubber Rolls

Fig. 15. (Center) A Roll-feed Disk Grinder with One Wheel Removed to Show Details of Roll-feed Mechanism

Fig. 16. (Bottom) Simple Semi-automatic Loading Device Installed on a Disk Grinder for Handling Seal Rings



Fig. 17. A Hand-fed Rotary Carrier which Holds Work in Hardened V-block Stations

minus 0.0004 inch for size. The operator merely loads the carrier by hand while an automatic kick-out unloads the rolls.

Loading may be fully automatic, using a hopper and a plunger arrangement to push the part into the holder. A simple semi-automatic loading device installed on a Gardner disk grinder is shown in Fig. 16. Seal rings are fed into the rotary work-carrier from the horizontal trough feeder. The production is from twenty to twenty-five per minute, with tolerances of 0.0002 to 0.0003 inch for parallelism and 0.0005 inch for size.

A hand-fed rotary carrier which holds the pieces

in hardened V-block stations is shown in use on the Hanchett machine in Fig. 17. The work-pieces — magnetic telephone cores — are ground on both ends within 0.0005 inch for length at the rate of seventy per minute.

The Hanchett machine shown in Fig. 18 is provided with a special wide opening between the grinding disks to take long tank-tread chain pins. Ordinarily, the maximum opening between the disks is 10 inches, but this special machine has an opening of 20 inches. The 3/4-inch diameter rods are ground square on the ends and to length within 0.002 inch. The power-driven rotary fixture has twenty-four hardened steel V-block stations in which the rods are held by chain clamping. The production is 1500 per hour. Another Hanchett machine of the same wide wheel-spaced type, using a similar rotary holder, grinds the ends

of lawn-mower spacer tubes at the rate of 500 complete pieces per hour. Formerly, the tubes were ground one end at a time, because on an ordinary grinder that was the only possible way. By using this double-disk grinder, production was increased by about 5 to 1.

A more elaborate fixture is shown on the Hanchett grinder in Fig. 19. Here the job is not to grind parallel faces on a piece, as is usual with double-disk machines, but to grind bevels to form the cutting edges on beer-can openers. The special rotating fixture has eight stations. One bevel of the point is ground on the left-hand disk as the piece moves from the periphery of the disk to the center hole. As the piece passes the center hole of the disk, the fixture indexes automatically and the opposite bevel is ground on the other disk wheel. The piece is finished in one pass. The production is forty per minute.

While modern machines are designed to handle disk wheels having several inches of usable abrasive, it is not wise to use wheels more than 1 inch thick on the older machines, since the bearings on old machines may not support the extra weight properly. The excessive vibration that results will produce unsatisfactory work.

Disks of vitrified bond can be operated at speeds as high as 6500 surface feet per minute, and those of resinoid bond up to 9000 surface feet per minute. Some engineers think that the best results are ob-

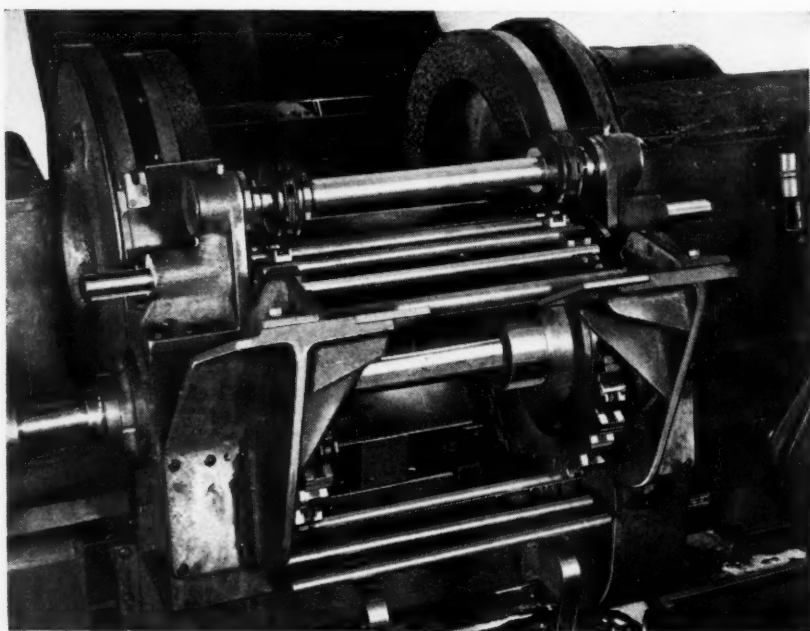


Fig. 18. Disk Grinder Provided with a Wide Space between the Disks for Grinding the Ends of Long Work

tained by keeping the wheel speeds well below the maximum, not only for safety, but for accuracy and production as well. Tests have shown that often the best results are achieved at speeds between 3000 and 5000 surface feet per minute.

To provide adequate chip clearance on some jobs, and so get faster and cooler cutting action, it is sometimes desirable to use perforated disk wheels that have holes extending entirely through the abrasive. However, when possible it usually is best to use plain disks, particularly when the size or shape of the work-piece is such as to make it likely that the work will gouge or dig into the perforated wheel.

As in all grinding, it is not entirely safe to make the selection of a wheel from a table, because of differences in the shop and machine conditions that may exist. However, such a table as accompanies this article is a good place to start in making a tentative selection of disk wheels for various jobs. A selection based on these recommendations should not be very far off, but only tests on the machine on which the wheel will be used can provide accurate data in the final decision.

* * *

Gearing Industry Reports Increase

The gearing industry, as represented by members of the American Gear Manufacturers' Association, shows an increased volume of sales for June, 1946, of 2.6 per cent, compared with May, 1946. This figure does not include turbine or propulsion gearing.

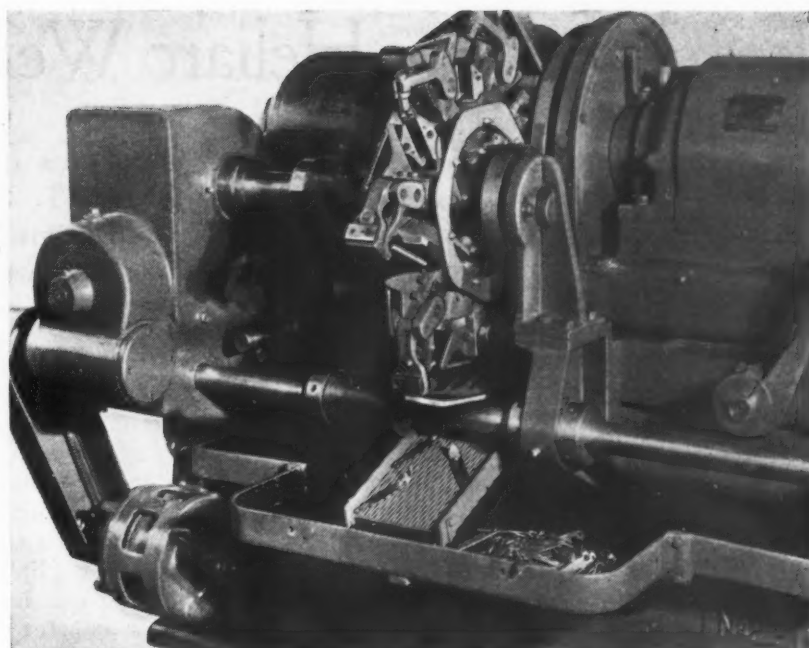


Fig. 19. Eight-station, Automatic Indexing Fixture for Grinding Bevels to Form the Cutting Edges on Beer-can Openers

Small Capacity Heat-Treating Furnace for Small Shops and Laboratories

A versatile heat-treating furnace especially adapted for small shops and laboratories requiring temperatures up to and including 1850 degrees F. has been placed on the market by the Pereny Equipment Co., 842 N. Pearl St., Columbus, Ohio. This furnace is said to be well suited to the needs of the small laboratory, the small shop, and the amateur metal-worker or school. The new furnace can be used not only for the heat-treatment of metals, but also for such work as porcelain enameling, jewelry enameling, laboratory control work, and ceramics and plastics applications. It is designed to be handled by inexperienced operators.

Wheel Recommendations for Disk Grinding

Material and Operation	Wheel Specifications (Standard Wheel Markings)*	Material and Operation	Wheel Specifications (Standard Wheel Markings)*
Aluminum Castings, Small, Light	C24-J7-B3	Piston-rings, Semi-finishing	C46-L7-B3
Aluminum Castings, Large, Heavy	C16-L7-B3	Piston-rings, Finishing	C80-J7-B3
Brake Linings	C16-K7-B3	Refractory Brick	C16-L7-B3
Brass and Bronze Castings	C16-K7-B3	Springs, Coil, Automotive	
Cast-iron Castings, Large, Heavy	C16-M7-B3	Heavy Wire	A16-M7-B3
Cast-iron Castings, Small	C24-L7-B3	Medium Wire	A24-M7-B3
Clutch Plates, Spring Steel	NA361-J8-B3	Small Wire	A46-M7-B3
Connecting-rods	A36-L7-B3	Extra Heavy, Railroad Type	A126-M7-B3
Dies, Drawing	A46-J7-B3	Leaf, Grinding Eye	A16-M7-B3
Knives, Paper, Machine, etc.	A60-H7-B3	Steel, Hard, Roughing	A16-K7-B3
Magnets	NA46-H9-B3	Steel, Hard, Finishing	A36-J7-B3
Malleable Iron, Annealed	A16-M7-B3	Steel Forgings, Heavy, Snagging	A16-M7-B3
Malleable Iron, Unannealed	C16-M7-B3	Steel, Soft, Roughing	A16-L7-B3
Motor Blocks, Snagging	BA126-V5-B1	Steel, Soft, Commercial Finish	A36-L7-B3
Piston-rings, Roughing	C24-M7-B3	Tile	C24-M7-B3

*Recommendations are those of the authors' company; however, the markings follow the standard system established by the Grinding Wheel Manufacturers Association.

Heliarc Welding—A Newly

One of the Latest Major Developments in the Field of Industrial Welding was Described by H. T. Herbst of The Linde Air Products Company before the Recent Semi-Annual Meeting of the American Society of Mechanical Engineers

HELIARC welding was developed and perfected during the war to meet the demand for a fast, dependable method of joining certain metals difficult to weld by existing methods. The process is now being used extensively for making peacetime products. With more people coming to know what the process is and what it will do, and with the collective experience of users expanding every day, the process is rapidly becoming one of the important fabricating techniques of the metal-working industries.

Heliarc welding is an electric arc-welding process. Highly concentrated heat is produced by an arc drawn between the work and a single, virtually non-consumable, tungsten electrode. In addition to the use of a tungsten electrode, Heliarc welding differs from other arc-welding processes in that the welding zone is at all times shielded by a sheath of inert gas that excludes the oxidizing atmosphere. Argon, the inert gas most generally used, is fed through a nozzle surrounding the electrode in the head of the Heliarc torch, and flows out to blanket completely the electrode, the arc, and the weld puddle.

This protective blanket of inert gas is the unique feature of the process; because of it, aluminum can now be successfully fusion-welded without the aid of flux, which was never possible before. Furthermore, with Heliarc welding, if recommended procedures are followed, most other metals can also be welded without flux, including high-carbon steels, high-alloy and stainless steels, magnesium, brass, Everdur, Monel, and copper.

The elimination of flux is of particular interest

to the designer, as well as to the welding engineer, for it removes some of the fabrication difficulties that have heretofore placed a limitation on the selection and specification of certain metals. In some welding operations, the removal of the corrosive salts resulting from the use of flux is an expensive and time-consuming job. When flux is required, definite limitations are placed on the joint designs that can be used. With Heliarc welding, there is no spatter or deposition of chemical salts, and no cleaning is required. The completed weld, if properly made, is smooth and clean, and in most cases requires no finishing treatment of any kind.

There are a number of differences between atomic-hydrogen and Heliarc welding. The idea of a protective gas shield is not novel or exclusive with Heliarc welding. In the atomic-hydrogen process, the hydrogen gas protects the molten pool and the heated metal adjacent to it. But in Heliarc welding this protective gas is inert and hence non-reactive with the molten metal. This process is therefore sometimes referred to as "inert-gas-shielded arc-welding." In Heliarc welding, the gas shield is there primarily as a protective cover, while in atomic-hydrogen welding the protective function of the gas is secondary to the principal function, which is to act as the vehicle for carrying and directing the applied heat to the welding area.

Heliarc welding was developed by Northrup Aircraft, Inc. Helium was the inert gas originally used, and it is from this gas that the process derived its name. In October, 1942, Northrup granted to The Linde Air Products Company an exclusive license for the Heliarc process, with right to sub-license.

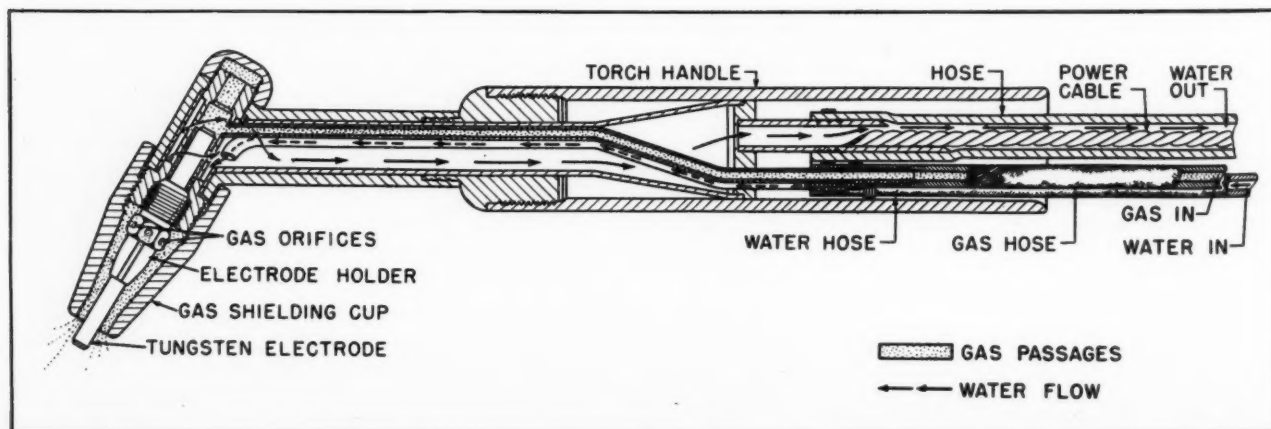


Fig. 1. Sectional View of Water-cooled Heliarc Welding Torch

Developed Arc-Welding Process



Fig. 2. Repairing a Defective Magnesium Casting by Heliarc Welding

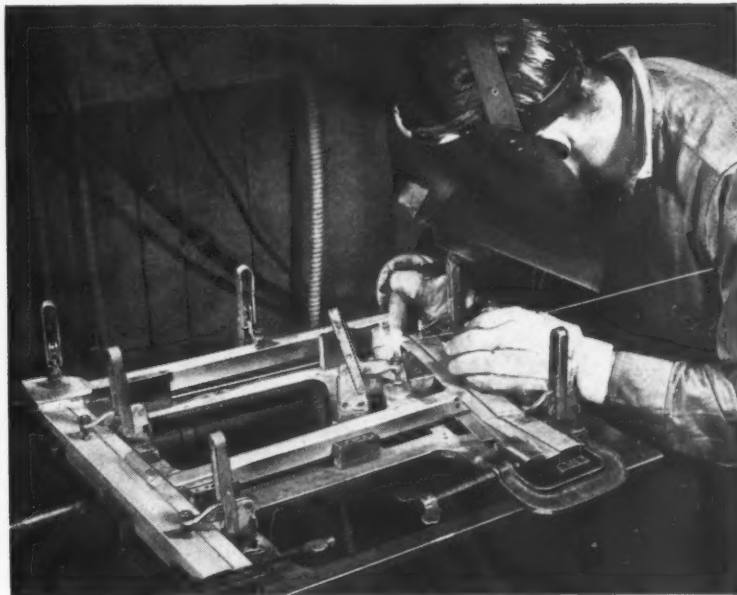


Fig. 3. Fabrication of an Aircraft Seat Frame Made from Magnesium, Using the Heliarc Welding Process

Since then the process has undergone considerable development and improvement. In general, this development work has been along three principal courses:

1. The investigation of the relative merits of different shielding gases to determine which will give the best results in Heliarc welding.
2. The establishment of procedure control for the selection and use of various types of electric power supply—a standardization that has resulted in higher operating speeds, better quality of work, and extended uses for the process.
3. The redesigning of the torch to provide greater operating capacity and to increase its ruggedness and efficiency.

Investigation of Shielding Gases

Argon is an inert monotomic gas, as is helium, and its qualifications as a shielding gas were early considered. There were several advantages in the substitution of argon for helium. Commercial argon of a very high degree of purity is available in large quantities through a nation-wide distribution system. Being a heavier gas, argon covers the weld puddle more effectively with less rapid diffusion; therefore, not as much of it is required for effective shielding. However, the most important advantage of all is that only with argon can all metals be welded by the Heliarc process without any flux. Because of these advantages, argon has largely supplanted helium as the shielding gas.

The selection of welding current depends on the type of metal welded. For example, direct current with reverse polarity was originally used for the

Heliarc welding of magnesium, but is not recommended for work on any other metal. Direct current with straight polarity is suitable for welding stainless steel, copper, and copper alloys, but should not be used on magnesium or aluminum.

Heliarc welding is also widely used with alternating current. Research has revealed that a high-frequency stabilization current superimposed on alternating current gives better results than when low-frequency welding current alone is used. Without this superimposed high-frequency current, it is difficult to start and maintain an arc. With the superimposed stabilization, however, welds can be started easily without actual contact of the electrode with the work, thus increasing the electrode life. The low-intensity arc produced by the high-frequency current provides a path for the main welding current, and in addition to aiding starting, stabilizes the welding arc, resulting in sound, uniform welds. Consequently, this feature is recommended. Standard equipment is available from several sources with high-frequency stabilizing supplied as a built-in feature.

High-frequency stabilized alternating current, in combination with the advantages of argon, has made possible the welding of aluminum without flux. It has also been found to have many advantages in magnesium welding over the direct-current reverse polarity first used.

Torch Design for Heliarc Welding

The torch illustrated in Fig. 1 is the standard torch, and can be used with either direct or alternating current. Although designed primarily for



Fig. 4. Stainless-steel Barrels are Welded at Twice the Rate of Production Obtained with Methods Previously Used

hand welding, it is also suitable for mechanical welding. Fitted to the rear of the handle are three lengths of hose. The first supplies argon, and the second supplies cooling water which circulates through the body of the torch. The third hose carries the power cable and also serves as an outlet for the cooling water. Thus, the power cable is completely surrounded by water. This feature makes it possible to carry extremely high currents on a relatively small, light, and flexible cable.

With a water flow of less than one pint a minute, the torch has a nominal maximum rating of 250 amperes. This is a rather conservative rate, however, since it is commonly used with currents

as high as 450 amperes alternating current, and 400 amperes direct current, straight polarity. Full protection against overheating of the torch due to failure of the water supply is afforded by a special fuse inserted in the cable circuit which automatically shuts off the power.

Water cooling also permits the use of a minimum of heat insulation in the construction of the torch, thus making it lighter and more maneuverable. Other advantages are long life for the torch parts and greater comfort for the operator.

The argon supply is conducted through the body of the torch and emerges from the gas orifices in the head of the torch. It is then guided down



Fig. 5. Stainless-steel Tubing has been Successfully Welded at a Speed of 10 Feet per Minute in the Experimental Welding Machine Here Illustrated

toward the weld puddle by the gas shielding cup which surrounds the tungsten electrode. The electrode itself fits into a replaceable electrode-holder which screws into the torch head. These holders are provided in sizes to accommodate electrodes of 1/16, 3/32, 1/8, 3/16, and 1/4 inch diameters.

Applications of the Process in Production

During the early part of the war, the Heliarc process was extensively used in the aircraft industry for repairing defective magnesium castings and for fabricating from magnesium sheets and tubing such items as fuel tanks, aircraft seats, and structural assemblies. As the advantages of the process became known for other "hard-to-weld" metals like aluminum and stainless steel, the range of its application broadened to include thousands of other metal products. Since the end of the war, the number of users of the process has been increasing steadily. Some typical applications are described in the following paragraphs.

The search for a rapid and satisfactory method of welding magnesium, needed so urgently by the aircraft industry during the early stages of the war, was largely responsible for the development of Heliarc welding. Some of the types of magnesium alloys successfully welded by the process are alloys C, G, H, J-1, FS-1, and M. Today, wherever magnesium is being fabricated, whether it be magnesium sheets, tubes, or bars, this welding process has marked advantages.

The repair of a defective magnesium casting by Heliarc welding is shown in Fig. 2. Since magnesium castings are damaged by being heated too rapidly, it is necessary to preheat them. The preheating time depends on the size and type of casting. During welding, it is important that the preheating temperature be maintained. Where this is impossible, the welding time should be restricted to ten seconds, and the casting should be reheated before completing the weld. After the welding is completed, the casting should be furnace-cooled to 250 degrees F., and then air-cooled.

A typical production operation is illustrated in Fig. 3, which shows the fabrication of aircraft seats of FS-1 magnesium. This particular part—the end frame of a double seat for use in a modern passenger liner—consists of five tubular sections which are welded in a jig. Distortion is held to a minimum by a carefully worked out sequence for the thirty-one welds required. The production time for this particular frame is fifteen minutes, or at the rate of four per hour per welding operator. In this operation, the torch is held in a rather unorthodox manner, but for this job it was found to be especially suitable.

Stainless Steel Production Applications

An early application on stainless steel was the fabrication of spouts for cream separators. Two halves were first cut to size, then heated with an



Fig. 6. Weld Made in 1/2-inch Thick Aluminum without Flux and Bent 180 Degrees without Fracture

oxy-acetylene flame and shaped over a mandrel. They were then assembled and welded together. The parts were hand-finished to a high polish by grinding. This application, as well as numerous others, indicated that savings of from 40 to 75 per cent could be made in cleaning and polishing operations on stainless steel welded by the Heliarc process, as compared with metallic-arc welding.

Some interesting savings were realized in the fabrication by Heliarc welding of stainless-steel barrels of 16-gage sheet. By means of the set-up shown in Fig. 4, it was found that the welding speed could be increased to approximately twice that employed with the former method, and at the same time rejections were decreased 80 per cent. In addition, a smoother and neater joint resulted.

A stainless-steel stove part was manufactured by a technique that was made practical by the new welding process. The part is a short tubular section with several small perforations. Formerly, these holes were drilled in a tube and the end machined to shape. With Heliarc welding, it was possible to fabricate this stove part from a sheet in which the holes were punched in a press. After the blanking operations, the sheet was formed into a tubular shape and placed in a jig for welding. In this manner, it was found that the part, small as it is, could be produced for 27 cents less than by the previous method. Similar savings have been effected in the fabrication of other parts that must

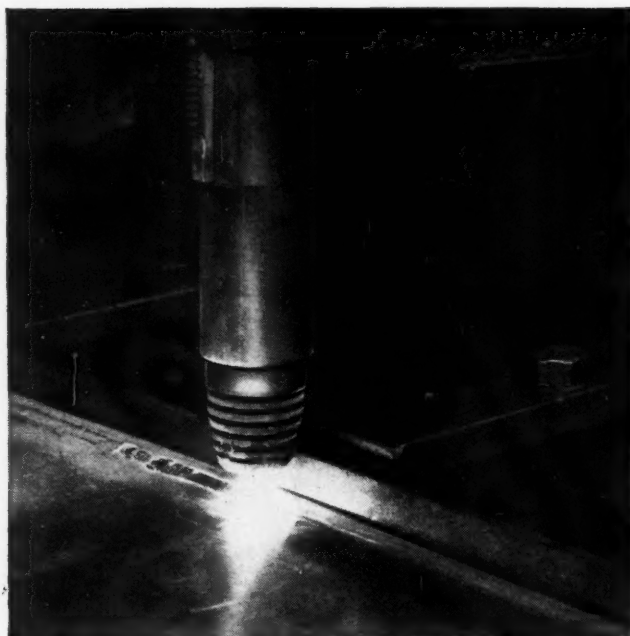


Fig. 7. Tanks of Aluminum Sheet Welded by a Heliarc Torch Attached to Motor-driven Carriage



Fig. 8. Passing the Torch along the Bead of a Welded Aluminum Tank Smooths the Surface

be perforated and in the production of tubular pieces of tapered shape, such as teakettle spouts and malted-milk-shake cans.

Stainless-Steel Tube Welding

Experimental work indicates that this process should be very desirable for the welding of stainless-steel tubing of high quality. An experimental tube-welding machine using the standard Heliarc hand-welding torch is shown in Fig. 5. Stainless-steel tubing has been successfully welded by this machine at a speed of 10 feet per minute. For production welding of this kind, supplementary shielding of the tubing adjacent to the weld puddle is recommended. Provision for this is not included on the machine shown.

In mechanized operations of this kind, the spacing between the electrode and the work-piece is constant, and the rate of loss of electrode is virtually zero. In fact, in welds over 300 feet in length, it has been impossible to determine the amount the tungsten electrode shortens. Hence, the necessity for an automatic arc-adjusting mechanism is largely eliminated. Other advantages of this method of welding stainless-steel tubing are that installation and operating costs will be lower than with present methods, and the quality and uniformity of welds should be equal to or better than that of welds produced by other methods.

Aluminum Welding Applications

As mentioned, high-quality welds in aluminum are readily made by the process without the need for any flux. Fig. 6 shows a weld made in 1/2-inch aluminum, 61SW, with a single vee and a 1/8-inch nose. The specimen has been subjected to a 180-

degree bend. The need for only a sealing bead on the reverse side shows the deep penetration possible with this process.

Great strides have been made within the past year in applying this method of fabricating aluminum. For example, consider this early wartime application—the fabrication of aluminum radio sending and receiving cabinets for the Navy's amphibious vehicles called "water buffaloes." In production, the following sequence of operations was observed: First, the edges to be welded were dipped in a 3 per cent solution of hydrochloric acid to remove aluminum oxide. Next, the parts for the cabinet were assembled in a jig, and the weld zones were coated on the outside with a fluid aluminum flux. Then the joints were welded by the Heliarc process, with the jig manipulated so that all welding was done downhill, thereby eliminating the need for filler rod. When the welding was completed, the cabinet was removed from the jig and submerged for a few minutes in a clean, hot water bath to remove all traces of flux. This hot water bath was necessary in order to prevent corrosive action of any flux residue.

It is interesting to note that within the past year improvements in technique and apparatus have been such that this job would now be carried on without the hydrochloric acid cleaning or the application of flux. However, despite these "extra" operations, with two such jigs and two workers the manufacturer was able to meet his schedule of twenty-four pairs of cabinets per day. The welding was done at an average rate of 45 feet per hour.

The fabrication of tanks and pressure vessels of aluminum is a large and natural field of expansion for Heliarc welding. An example is the manufacture of tanks of 2S half-hard aluminum sheet, 5/32 inch thick. Such tanks, with inside dimensions of

3 feet by 4 feet by 20 inches deep, were used to mix powder for the Navy. Each was made of three separate parts. The bottom and two sides were formed from flat aluminum stock, and then the two ends were welded to the central piece, using a jig to hold the parts in place.

The first weld, shown in Fig. 7, was made along the bottom of the tank by joining one edge of the central portion to the end piece. The welding torch was attached to a motor-driven carriage, which rode on a track parallel to the welds. When the bottom weld was completed, the jig was rotated 90 degrees and one side weld was made in the same manner. Then the jig was rotated in the reverse direction 180 degrees and the other side was completed. The same procedure was used in welding the other end piece. The welding progressed at a speed of 8 inches per minute. No filler rod was used in this operation and, of course, no flux. The plate-edge preparation consisted only of filing down high spots, the edges then being rubbed down with steel wool.

At the conclusion of the machine weld, the assembly was removed from the jig and the inside bead smoothed down by a hand pass of the torch over the joint, as shown in Fig. 8. With this procedure, a minimum of hand polishing was needed to give the extremely smooth surface required.

Heliarc welding is still in its infancy, but it has already shown great promise. Most applications up to the present time have been manual and on light-gage material that did not require the introduction of filler rod. However, some very successful mechanical-welding installations have been made, and filler rod has been introduced with success both manually and automatically in butt-welding materials up to and including 1/2 inch in thickness. With the indications of a large potential increase in the commercial uses of magnesium, aluminum, and stainless steel, it is apparent that the new method of welding has very great possibilities.

* * *

Meeting of Industrial Diamond Association

The first meeting of the Industrial Diamond Association of America was held recently at the Book-Cadillac Hotel, Detroit, Mich. The meeting emphasized the need of research to provide further progress and continued improvement both in the application of industrial diamonds and in trade relations within and without the industry. There were five general sessions of the Association, in addition to committee meetings and meetings of the board of directors. The Association has a membership of sixty-five firms. Athos D. Leveridge is executive manager, with headquarters at 501 Lexington Ave., New York 17, N. Y.

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The problem of reconversion is the recovery of industrial freedom.

Tool Engineers to Hold Semi-Annual Meeting in Pittsburgh

The American Society of Tool Engineers will hold its semi-annual meeting at the Hotel William Penn, Pittsburgh, Pa., October 10 to 12. The technical sessions will begin Thursday afternoon, October 10, with a session on "Welding and Design." In the evening, there will be another session on "Gas Turbine Tooling and Production." Friday there will be sessions on "Precision Castings," "Tooling with Carbides," and "Manufacturing Analysis." Saturday morning a technical session will be devoted to "Multi-Form Grinding."

Plant visits are being planned to the Westinghouse Gear Works, the Irwin Works of the Carnegie-Illinois Steel Corporation, the Firth-Sterling Steel Co., the National Tube Co., the Mesta Machine Co., Westinghouse East Pittsburgh Works, Westinghouse Airbrake Co., the extrusion plant of the Aluminum Co. of America, and the James H. Mathews Co.

* * *

Pneumatically Operated Fatigue-Testing Machine

A pneumatically operated fatigue-testing machine was described by F. B. Quinlan, of the General Electric Co.'s Schenectady Works Laboratory, at a recent meeting of the American Society for Testing Materials. The device was originally developed for testing gas-turbine buckets, but has proved so efficient and adaptable that it is likely to have wide peacetime applications. The operating mechanism of the new device is extremely simple. It consists of a tuned air column in which the tuning is accomplished by decreasing the length of the air path, much as a trombone player changes the tone of his instrument by moving the slide.

The part to be tested is placed in such a position between two air paths or tubes that the air from the open ends strikes on the upper end of the sample piece, causing it to vibrate. Since the piece vibrates at the same frequency as the note in the testing "trombone," and air is continually fed through the tubes, the air impulses cause continuous vibration of the test-piece. By adjusting the tube lengths so that the air in them vibrates at the same frequency as that of the test sample, it is possible to produce very large and stable amplitudes of vibrations with comparatively small amounts of air. The sample vibrates until, due to fatigue, its vibrations are out of phase with those of the tuned air, when a break occurs.

This pneumatic fatigue-tester has produced stresses as high as 100,000 pounds per square inch with no more air than that supplied by an average vacuum cleaner. The testing device has no parts to wear out, since nothing moves but the part to be tested. Parts can be tested at temperatures from below zero up to 1700 degrees F.

Engineering News

Thermocouple Measures Temperatures of Molten Materials

A new portable thermocouple for measuring the temperature of molten aluminum, which is also considered suitable for measuring the temperature of molten lead, babbitt, zinc, type metal, and similar low melting-point metals, has been developed by the Brown Instrument Co., Philadelphia, Pa. The metal temperatures are measured below the surface of the bath in a matter of ten or twelve seconds. The readings are unaffected by the wire conditions. In operation, the couple is immersed several inches below the surface of the bath and held there until a steady reading is obtained. The couple is then withdrawn, the adhering metal being removed by shaking the handle of the thermocouple.

Pressure Cap on Ford Radiators Prevents Water from Boiling at 212 Degrees

A development for Ford motor cars used under abnormal driving conditions, like mountain climbing or desert travel, makes water boil, not at 212 degrees, but at a temperature from 12 to 15 degrees higher. This is accomplished by using a pressure cap for sealing the radiator so that the cooling water may be kept under a pressure of from 3 1/2 to 4 1/2 pounds. As the pressure is increased, the boiling point of the water is increased, and the engine continues to operate efficiently and safely even though the conditions raise the temperature of the coolant to a point above the normal boiling point of water. The use of the pressure cap also lessens evaporation; and in winter, anti-freezing compound losses are reduced.

Gas-Turbine Jet-Propulsion Engines for Aviation Service

It seems safe to say that the gas turbine will become a useful new engine for locomotives and ships, and possibly for power stations. In order to answer the problem relating to greater speeds in the air than can be provided by reciprocating engines, aviation engineers recently turned to the jet propulsion type of gas engine. Jet-propelled airplanes have already established breath-taking speed records, even though jet engines are still in their infancy.

The Westinghouse Electric Corporation has produced a large number of jet engines for the Navy. One of these is 19 inches in diameter, and another is only 9 1/2 inches in diameter and can be carried by one man. Larger and more efficient engines than these are now being built. It is said that these

engines will produce more power for a given weight than any engines of any type yet built. They develop more than a pound of thrust for half a pound of weight. They also have less than one-half the frontal area of reciprocating engines of comparable output, which is of extreme importance in aviation. Gas-turbine engines for aviation purposes will be used only for high speeds. For smaller, slower-speed aircraft, the reciprocating engine is expected to remain dominant.

Water-Repellent Coating Speeds up Lighting of Fluorescent Lamps

Faster starting of a certain type of fluorescent lamp now made at the factory of the General Electric Co., Hoboken, N. J., has been made possible by the application of a water-repellent material known as "G-E Dri-Film." This material forms an invisible and permanent "raincoat" over the lamp, and when metal is used adjacent to the lamp, such as a reflector, the lamp is practically insensitive to high humidity. Tests have shown that lamps coated with this material will operate satisfactorily even under 100 per cent relative humidity.

Giant Electronic Tube Generates High-Frequency Waves

The "Resnatron," a big, 500-pound electronic tube developed by Westinghouse, was used during the war to interfere with enemy radar receivers by blanketing the sky for several hundred miles with short-wave static. The tube is now being modified for peacetime service in television transmitters.

High frequencies are obtained from this tube by oscillating electrons until they move back and forth a billion or more times each second. The electrons are first emitted from twenty-four separate heated filaments. Traveling in groups spaced only one ten-thousandth of a millionth of a second apart, the electrons reach a part of the tube called a "resonant cavity." This is a hollow, copper-walled space that oscillates at a particularly high frequency when excited by electrons traveling at the same frequency. Here most of the energy is piped out to the antenna for transmission. The remainder, however, is channeled back into the circuit to help facilitate the flow of electrons at the proper frequency. The process is repeated a thousand million times a second.

Construction of the tube presented many problems, not the least of which was to remove the heat generated by collision of electrons with parts of the tube. More than fifty feet of copper tubing is used to carry water to cool the main tube elements.

Hot-Spinning Heavy Tank Heads

(Continued from page 147)

fers to the furnace were required before the forming of this head was completed. The finished head, which is used in a reactor of an oil refinery, measures 14 feet 9 51/64 inches in diameter, 2 37/64 inches in thickness, and 47 3/4 inches in over-all depth; it weighs 32,450 pounds.

In many cases, it is necessary to machine the edge of the complete head and provide flues so that the heads can be readily joined to other parts of the equipment for which they are intended. The necessary machining is performed on vertical boring mills.

Flue-holes, hand-holes, and manholes required in these heads are first flame-cut. The head is then placed on an open-front hydraulic press and a heavy cast-iron ring is put on the head, with its inner diameter concentric with the flame-cut hole. The area of the head immediately surrounding the flame-cut hole is then heated by means of oxy-acetylene torches, as shown in Fig. 9. A plug mounted on the ram of the hydraulic press is then pushed through the hole.

The speed of the operation is carefully controlled, so that the metal will form slowly, thus avoiding excessive thinning and guarding against rupture of the metal. To obtain a long flange around a flue-hole, the flueing job is often started with small holes, progressively larger dies being used until the holes are of the required size. Holes from 6 to 60 inches in diameter have been thus produced in spun heads. These dimensions, however, are not necessarily limitations.

Practically all alloy-steel heads, and many others, depending on the material and intended use, are annealed upon completion of the spinning operation. Hot-spun elliptical heads are shown entering one of the gas-fired, car-bottom annealing furnaces in Fig. 10. Many heads are also cleaned by grit-blasting, as shown in Fig. 11.

When a number of tube and staybolt holes are to be drilled in a certain area of the head, it is possible to obtain additional strength in that area by welding together plates of different thicknesses to obtain the circular plate used for spinning. The "flanged-only" head shown in Fig. 12, which is being used in a Scotch marine boiler, was made from two different thicknesses of steel. The required flat circle, 203 1/2 inches in diameter, was cut from a plate formed by welding two plates together. One of the plates was 209 1/2 inches long by 146 inches wide by 15/16 inch thick. The other was 189 inches long by 63 1/2 inches wide by 1 5/32 inches thick. The thicker plate was used for providing additional strength to that portion of the head in which the tube and staybolt holes were formed.

The finished head has an outside diameter of 15 feet 3 inches, thicknesses of 15/16 inch and 1 5/32

inches, an outside radius of 3 1/2 inches, a straight flange of 8 1/2 inches, an over-all depth (not including the flue-hole height) of 12 inches, and a weight of 8630 pounds. The three flue-holes each have an inside diameter of 3 feet 11 inches, an over-all height of 6 inches, and a corner radius of 2 1/2 inches. The two manholes are 12 by 16 inches, with an over-all depth of 4 9/16 inches, and a corner radius of 2 1/2 inches.

* * *

Selected Sets of Replacement Parts

An idea that appears to be of considerable interest and value in the machinery industries is embodied in the selection of parts for a welding service unit kit that has been made available to industry by the Moorewood Electric & Mfg. Co., 1718 E. Florence Ave., Los Angeles 1, Calif. The parts in this set are so selected as to include the necessary number of different replacement parts that are likely to be required in a given period. In this particular case, the replacement parts include what is needed to keep four welding units in continuous operation. When the kit becomes depleted, obviously a new kit is ordered.

This idea could doubtless be advantageously adopted by machine shop equipment builders in many fields. Some parts wear out or require replacement oftener than other parts, and a larger number of such parts would be supplied in the kits than of parts that require replacement only occasionally.

* * *

American Locomotive Co. Builds Seventy-Five Thousandth Locomotive

The seventy-five thousandth locomotive to be built by the American Locomotive Co. will be completed at Schenectady, N. Y., in September. The serial number 75,000 has been assigned to a new 6000-H.P. Diesel electric main-line locomotive for the Central Railroad of New Jersey. The company's first locomotive, *The Sandusky*, was built at Paterson, N. J., in 1837, and was placed in service a year later on the Mad River and Lake Erie Railroad, running between Bellevue and Sandusky, Ohio, a distance of sixteen miles.

The fifty-thousandth locomotive—a Pacific type—was delivered to the Erie Railroad in 1911. This was the largest Pacific type locomotive built up to that time. It is still in service on the Erie Railroad's commuter run between Jersey City and Tuxedo, N. J. The railroad recently considered scrapping it, but the commuters who had grown fond of the old locomotive made such a vigorous protest that it will be continued in service.

Tools for Scrap or for Training our Youth?

EDUCATIONAL institutions the country over—particularly high schools and elementary-grade schools—are in dire need of machine tools and other shop equipment for teaching the rudiments of the various trades. The vast majority of our school children do not go to college, either because of financial handicaps or inaptitude for higher education. These children deserve sufficient training in the crafts during their school years to enable them to select wisely a trade that will insure a good livelihood throughout their future years. The taxes which their parents pay entitle these school children to just as adequate training to cope with the problems of life as those students who are privileged to attend institutions of higher learning.

Unfortunately, however, our public schools today lack the funds to buy either an adequate supply of such equipment or machines of high enough quality for a worthwhile trade training program. Municipal taxes have universally been kept as low as possible because of the burden imposed by the sky-high Federal taxes. Schools are compelled to operate on budgets not much higher than those in pre-war years. As a result, many schools that provide manual training are equipped with machines that would be a disgrace to the meanest roadside shop. How can a boy obtain a high regard for the machinist or patternmaking trades if schools are equipped with the cheapest types of only the most elementary machines of that trade? There are high schools attempting to instruct boys in the machinist trade which do not have even a decent milling machine or shaper—not to mention such desirable machine tools as grinding and gear-cutting machines.

Immediately after the close of hostilities, the War Department inaugurated a program whereby surplus equipment was made available to schools without any cost except that of transporting the equipment from factories to schools. So much red tape was involved, however, that only a comparatively small number of educational institutions were able to avail themselves of this opportunity, and few of these were below college level. Publicity concerning the program was so ineptly handled that the majority of schools were completely unaware of it. Once surplus equipment was assigned to the War Assets Administration, all equipment was removed from this "free" list.

In an attempt to help the schools purchase surplus equipment, the War Assets Administration has allowed them a 40 per cent discount from the prices established by the Clayton Formula. The prices are still far beyond the ability of most schools to pay. Stock piles of equipment in the meantime have grown so large that much valuable machinery is of necessity being allowed to deteriorate, and will become worthless for any use other than scrap. How much more sensible it would be to make this equipment available to schools for a nominal price, or even for nothing! In the schools, the equipment would be maintained in working condition; moreover, it would be immediately available to Government agencies in the event of another national emergency.

Regulations governing the disposal of surplus equipment should be changed so as to eliminate red tape and give our future skilled workmen a short-cut to the trades for which they have natural abilities.

Charles O. Herb

Erik Oberg Retires As Editor of MACHINERY

FORTY years ago this month, Erik Oberg joined the editorial staff of MACHINERY. For a period of approximately twelve years he served as associate editor, and during this time he also edited MACHINERY'S Reference Series, wrote a number of technical books, and was the co-author of MACHINERY'S HANDBOOK and MACHINERY'S ENCYCLOPEDIA. He became Editor of MACHINERY in 1918. Since then—for more than twenty-eight years—Mr. Oberg has guided MACHINERY'S editorial activities.

Mr. Oberg was born in Sweden and graduated from the Boras Technical College. After coming to the United States, he was employed for several years as draftsman and machine designer by the Pratt & Whitney Co., and the Cincinnati Milling Machine Co.

During his work as Editor, he won distinction in engineering circles, having served for ten years as treasurer of the American Society of Mechanical Engineers and as a member of various important committees of that Society. In the first World War, Mr. Oberg was a member of the Committee for Adjusting the Industries to War Work appointed by the Government. During World War II, he served a period with the War Department as consultant to the Army Air Forces. He was also



vice-chairman of the Manufacturing Engineering Committee of the American Society of Mechanical Engineers, working under the auspices of the War Production Board.

Now, after forty years as Editor, Mr. Oberg has decided to retire from active service, effective September 1. He has agreed, however, to serve as consulting editor, so as to give MACHINERY the benefit of his rich experience and wide acquaintance. In that capacity, he will continue to call upon his many friends throughout the machine tool and metal-working industries. Mr. Oberg has the best wishes of MACHINERY'S

entire organization for a happy fulfillment of his present plans.

Charles O. Herb has been appointed Editor and assumes his responsibilities with the September number. Mr. Herb joined MACHINERY'S editorial staff over twenty-seven years ago and has been managing editor for the last four years. He is the author of many of the feature articles that have appeared in MACHINERY during past years, and is also author of the books "Die-Casting" and "Machine Tools at Work." Mr. Herb is a member of the American Society of Mechanical Engineers, the American Society of Tool Engineers, and the Army Ordnance Association.

Prevention of Chatter in Reaming

IN a paper entitled "Cutting Action of Reamers," read by T. F. Githens, mechanical engineer of the Cleveland Twist Drill Co., before the recent semi-annual meeting of the American Society of Mechanical Engineers in Detroit, the subject of chatter in reaming operations was referred to. The author stated that there is an erroneous opinion prevalent that reamers with an even number of flutes chatter more than those with an odd number. In the experience of his company, a reamer with an odd number of flutes chatters as readily as one with an even number, especially when the reamer has more than four flutes.

Chatter can sometimes be eliminated by reducing the amount of clearance. To make reamers suitable for reaming most kinds of materials met with

in ordinary machine shop practice, a considerable amount of clearance must be provided. Unfortunately, this is also conducive to chatter, unless offset.

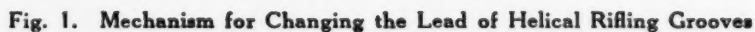
In some cases, chatter can be reduced by as rigid and strong a set-up of the work as possible and by the use of pilot and guide bushings. It can also be decreased by a reduction in the speed of the reamer. Too low a feed may in some cases cause chatter, due to glazing of the hole. Too great a positive rake angle and too much negative rake are other possible causes of chatter.

Reamers, as commercially made, usually have the cutting teeth unequally spaced; that is, a six-fluted reamer does not have the cutting teeth exactly 60 degrees apart. The reason for this uneven spacing is to reduce the possibility of chatter.

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and other Devices

By GEORGE TONN

tion in flight. "Increasing twist" is rifling in which the inclination of the tangent to the groove at any point with the axis of the bore increases from the breech to the muzzle end of the barrel. The working surface of cam *F*, Fig. 1, in the mechanism to be described can be designed to increase the twist uniformly or give the rifling helix any curve desired.



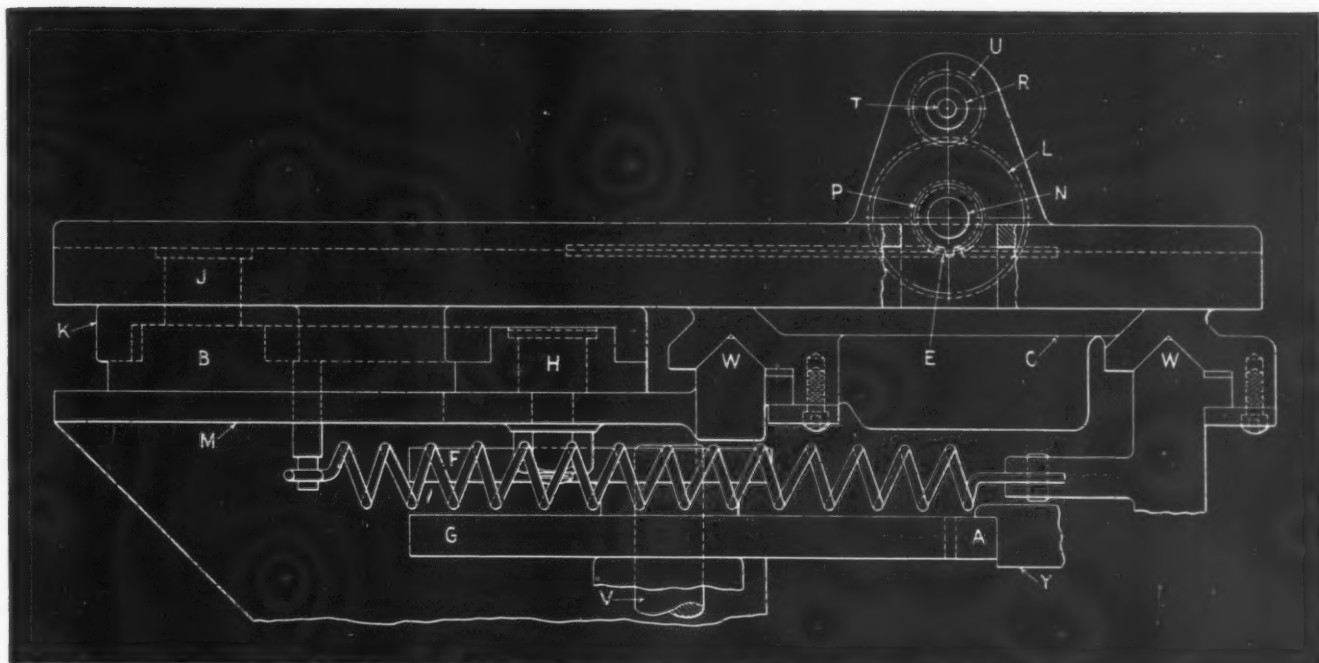


Fig. 2. Left-hand End View of the Rifling Device Shown in Fig. 1

Cam *F* in the mechanism illustrated has been designed to give uniformly accelerated rotation to the rifling cutter until the helical rifling groove has a lead of one turn in 10 inches. Then, at a distance of 1 inch from the muzzle of the barrel, the helical rifling groove is given a uniform twist by making the surface of the cam concentric with its shaft for this portion of the travel. This uniform twist of the rifling groove gives steadiness to the projectile as it issues from the bore of the gun.

Referring to Figs. 1 and 2, carriage *C*, which is actuated by a lead-screw, splined shaft, or hydraulic means (not shown) moves on ways *W* of the rifling machine and pulls the cutter through the gun barrel. Rack *A*, which is fastened to the under side of the carriage by means of bracket *Y*, moves with the carriage. This rack, meshing with gear *G*, turns the vertical shaft *V* and the cam *F*, which is keyed to the shaft.

Cam *F*, acting on roller *Q*, which is pinned to swivel-bar *B*, causes the swivel-bar to pivot about

stud *H*. Swivel-bar slide *K* is connected to cross-slide *D* by stud *J*, about which it pivots. The swiveling movement of bar *B* causes the cross-slide to move outward, away from the carriage, in cross-slide housing *Z*. Cam *F* can be so designed as to make this a uniformly accelerated motion. Roller *Q* is kept in contact with cam *F* by means of spring *S* and weight *X*, which is mounted on cable *O*.

Rack *E*, which is fixed to the cross-slide, meshes with pinion *P*, thus rotating gear-shaft *N*. Gear

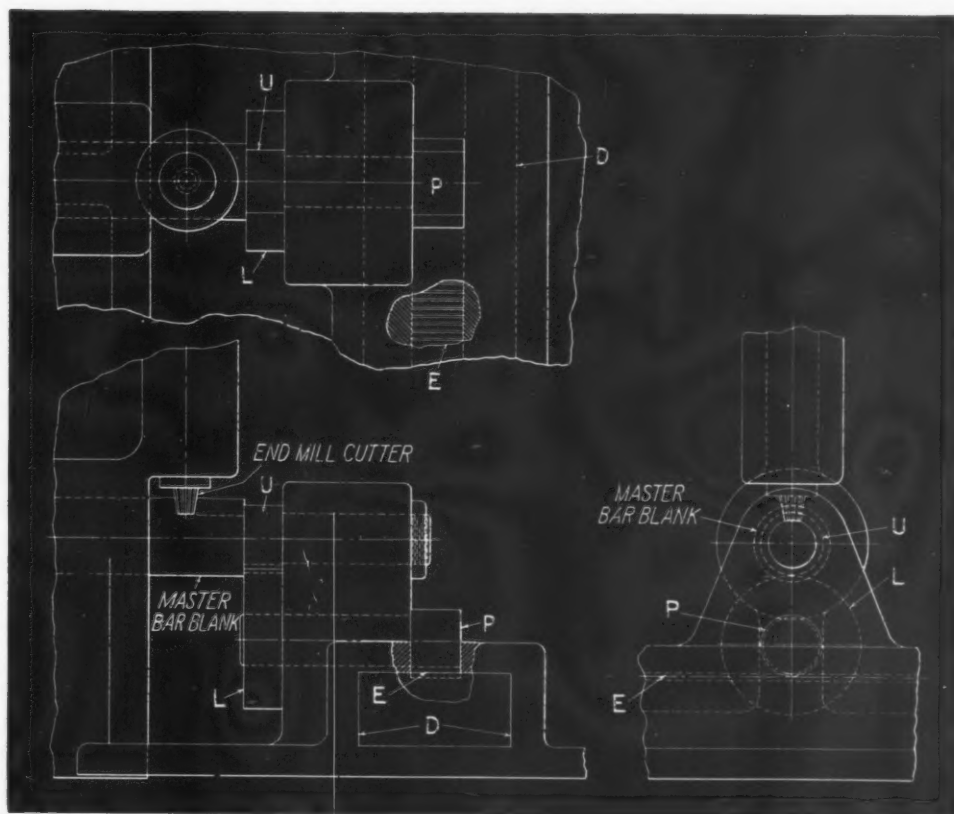


Fig. 3. Modified Set-up of the Rifling Mechanism Shown in Fig. 1 being Used to Mill a Helix with a Uniformly Increasing Lead on a Master Bar

L, which is keyed to the gear-shaft *N*, meshes with pinion *U*, thereby revolving the rifling cutter shaft *R* and tube *T*. When the rifling cutter has completed its stroke through the gun barrel, the carriage reverses its travel, which reverses the direction of rotation of vertical shaft *V* and returns gear *G* and cam *F* to their starting positions.

The helical pitch of the rifling groove at any point on the cam can be determined by disengaging gear *G* from the carriage rack *A*, locking swivel-bar *B* in the position at which the pitch is to be determined, and measuring the distance traveled by the carriage while the rifling cutter makes one revolution.

This device can be adapted to the milling of master rifling bars, as shown in Fig. 3. The bar is fed into the end-mill, and is revolved at the required speed for the desired lead by means of rack *E* and gears *P*, *L*, and *U*.

Automatic Variable-Lift Cam Mechanism

By L. KASPER

A variable movement is imparted to the slide of a wire-forming machine by the automatic variable-lift cam shown in the accompanying illustration. The requirements in designing this machine were that the slide be given four different degrees of movement during the cycle and that the timing of the movements coincide with each revolution of the driving shaft.

Referring to the illustration, shaft *A*, revolving in the direction indicated by the arrow, rotates the

gear *B*, which is keyed to it. Gear *E* is free to rotate on shaft *A*, and carries the cam *F*, which is also free to rotate on the shaft. Gear *E* is revolved in a direction opposite to that of gear *B* through the idler gears *C* and *D*, which rotate freely on studs attached to a stationary part of the machine. The cam *J* is keyed to shaft *A*, and thus is caused to rotate with it.

Cam *J* consists of a heavy disk, which is grooved to carry the slide *H*, and a retaining plate, which is screwed to the disk. Slide *H* is shaped at its upper end to form the lobe of the operating cam. Roller *G*, which is attached to slide *H*, passes through a slot in the body of cam *J* and contacts the periphery of cam *F*. Slide *H* is slotted to permit shaft *A* to pass through. Slide *K* is provided with a roller *M* which follows the outline of cam *J*.

When the mechanism is in the position shown, roller *G* is in contact with the high section of cam *F*. Gear *E* receives its rotary motion from gear *B*, reduced in the ratio of 1 to 4 by virtue of the relative pitch diameters of the gear train. Cam *F*, being attached to gear *E*, also rotates at the reduced rate of one-fourth revolution to one complete revolution of shaft *A*. As cam *F* is provided with four sections, each with a different radius, one of the four surfaces will be brought into contact with roller *G* at each revolution of shaft *A*. Thus roller *G*, being attached to slide *H*, causes slide *H* to move to one of four positions, depending on the relative position of cam *F*. The slide *K* is thereby moved a distance equal to the distance which the end of slide *H* projects beyond the periphery of the body of cam *J*. In operation, the outer end of slide *H* controls the movement of slide *K*, while the thrust of slide *K* reacts on cam *F*.

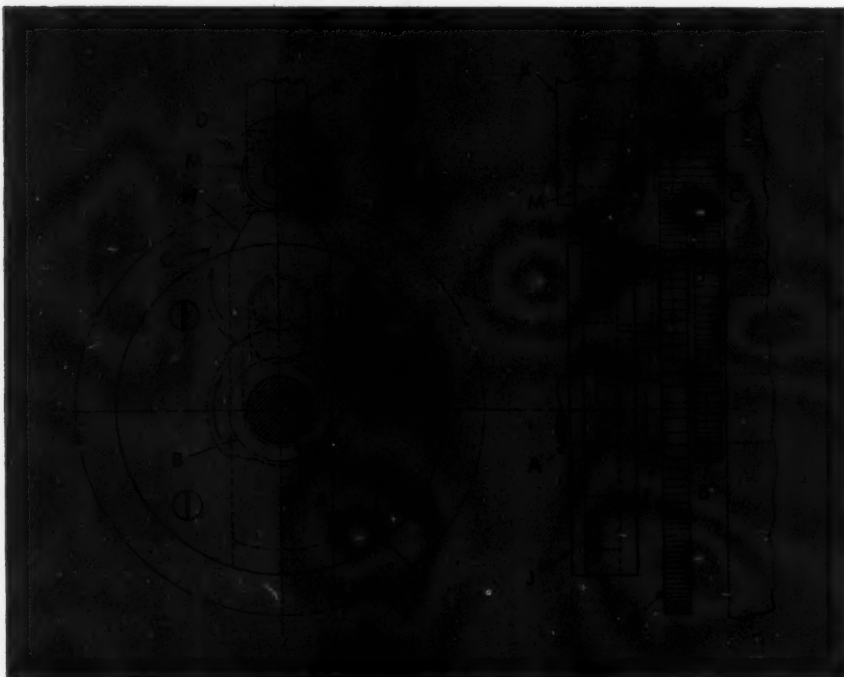
* * *

Aluminum-Alloy Selector

A great deal of technical information concerning eighteen of the most widely used aluminum alloys is presented in a slide-rule type of chart, 8 1/2 by 11 inches, known as the "Reynolds Aluminum-Alloy Selector," and available from the Reynolds Metals Co., Department 47, 2500 S. Third St., Louisville 1, Ky. The price of this slide-rule chart is \$1.

* * *

The New York Belting & Packing Co., Passaic, N. J.—one of the oldest manufacturers of industrial rubber products in the country—is observing the one-hundredth anniversary of its founding this year.



Automatic Cam Mechanism which Gives a Variable-lift Movement to the Slide K of a Wire-forming Machine

Tool Engineering

IDEAS

Self-Locking Adjusting Device

By MICHAEL GOLDBERG
Bureau of Ordnance, Navy Department
Washington, D. C.

A simple locking arrangement can be provided on hand adjusting devices or light hand-actuated drives by utilizing a commercially available snap-ring, as shown in the illustration. The ring *A* is assembled between two sections *B* and *C* of the adjusting shaft and, together with pins on the two shaft sections, serves as a self-locking coupling. The knob *D* can be rotated in either direction for making clockwise or counter-clockwise adjustments of any part attached to shaft *C*.

The recessed hole in which the snap-ring is assembled should be made slightly smaller than the free diameter of the ring. The actual difference in dimensions between the recessed hole and the free ring diameter depends on the elasticity of the snap-ring and the backing torque that it is desired to overcome when knob *D* is turned.

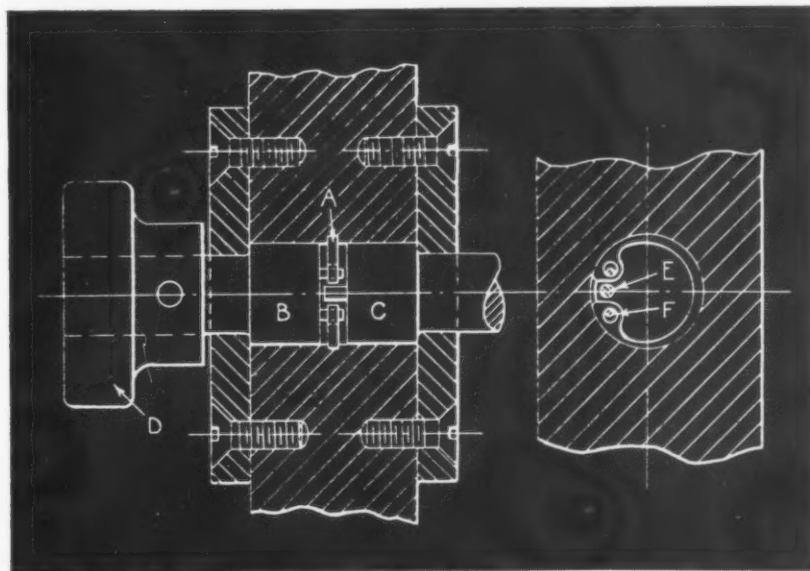
Shaft *C* is provided with an inserted pin or lug *E*

which is positioned between the open ends of the snap-ring with a certain amount of clearance between the pin and the ring ends. Shaft *B* is provided with two pins *F* which engage holes in the ends of the snap-ring. These pins are positioned eccentrically with respect to the snap-ring holes, the centers of the pins being located nearer the gap between the ends of the ring.

Initial motion of shaft *B* in either direction will contract the snap-ring and reduce the holding friction against the housing. Continued motion of shaft *B* will be transmitted through pins *E* and *F* to shaft *C*. When no input torque is being applied, any backing movement of the shaft *C* will expand the snap-ring and increase the locking friction. Thus, when properly designed, the mechanism locks shaft *C* against any motion. The provision of a recess for the snap-ring helps to prevent skewing of the ring in the housing. However, if the ends of the driving and driven shaft sections are close enough together, the recess can be eliminated.

The device has the properties of a self-locking worm drive, though there is only a 1 to 1 ratio of the motions. It is useful for preventing "kick-back" in light drives operated by hand. This device

Drawing Showing How the Use of a Commercially Available Snap-ring Provides a Self-locking Feature for Adjusting Devices or Hand-operated Drives



is especially useful on machines or instruments that require a number of adjusting means. The use of this simple arrangement on each adjusting shaft will prevent the making of any one adjustment from disturbing the settings of the other adjusting devices.

Tool for Gaging Pressure Exerted by Brushes on Commutators of Motors

By ALBERT M. THOMAS
Toolmaker, General Repair Shops
B.M.T. Division, New York City Subways

The pressure exerted by brushes on the commutators of electric motors must be carefully controlled. The brushes must be accurately spaced on the commutator and make absolute and uniform contact with it, irrespective of the speed of the motor. Imperfect contact between brush and commutator creates sparking and may cause short-circuiting of the motor. Also, a brush that imparts too much pressure on the commutator has a tendency to groove it and bridge the insulating space between segments of the commutator, thus shortening the life of the motor. The tool illustrated was designed to gage the amount of tension applied to the springs in the brush-holders so that the brushes will make the proper contact with the commutator.

This tool, a front view of which is shown in Fig. 1 with a brush-holder in position for adjusting the springs, contains a torque-wrench A with a dial calibrated in foot-pounds. The brush-holder is held in position in the tool by the screw-operated clamps F. Crank C, which may be seen more clearly in Fig. 2, is adjustable along the square bar B in order to locate the hinged, vertical rod D over one

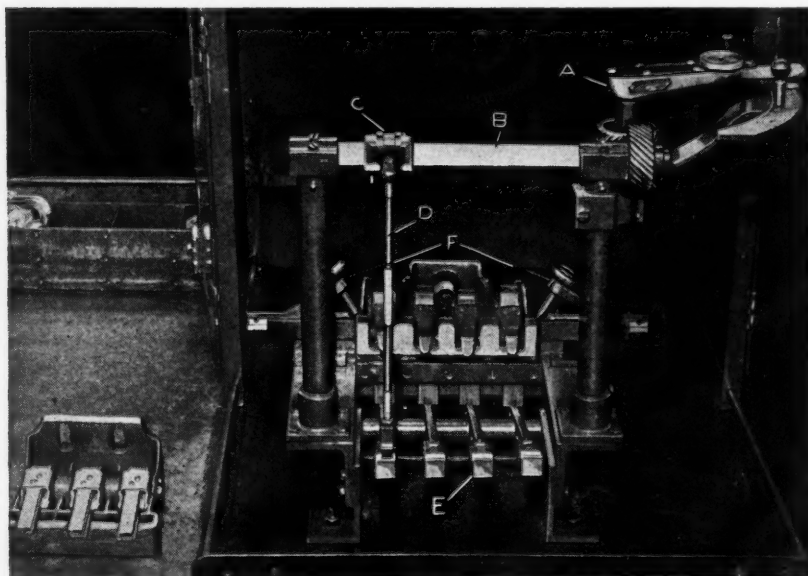


Fig. 1. The Pressure Exerted by Brushes on the Commutators of Electric Motors Can be Gaged by This Tool

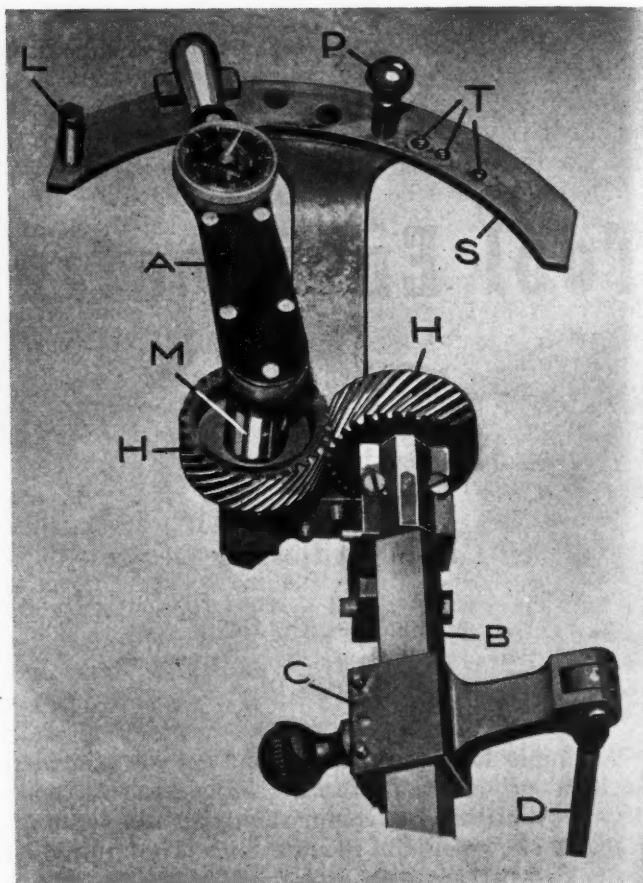


Fig. 2. Enlarged Top View of a Portion of the Tool Shown in Fig. 1. The Dial of Torque-wrench A Indicates the Tension of the Springs in the Brush-holder

end of any of the four pivoted, horizontal levers E. The other ends of levers E extend under the brush-holder seats, which transmit the pressure exerted on the torque-wrench to the plungers that lift the brush springs.

The torque-wrench is moved on the cast-iron sector S, Fig. 2, from stud L to pin P, which position corresponds to the tension desired in the springs. If the dial of the torque-wrench does not indicate the desired tension, the springs are adjusted manually. Different motors naturally require different pressures of the brushes on the commutators. This is taken care of by changing pin P to any one of the threaded holes T corresponding to the pressure required.

The torque-wrench fits into a socket in shaft M, which transmits the force exerted on the wrench to the square bar B through spiral gears H. It is important to have the pressure that registers on the dial of the torque-wrench as nearly equal to the resistance offered by the springs of the brush-holder as possible. This necessitated a design that located the pivots of the tool in

such positions as to minimize the effect of the weight and frictional interference of members between the dial and springs.

Die Designed to Produce Curled Eye at One End of Steel Strip

The tool shown in the accompanying illustration was designed for the production of curled eyes in tough mild-steel strips. The strips are 1/4 inch wide by 0.028 inch thick, and are blanked, pierced, and shaped in an earlier operation to the profile shown at X. The curled eye must be accurately formed to an internal diameter of 1/16 inch.

Referring to the illustration, *H* is the punch-holder, which is drilled and counterbored centrally to receive the pressure pad *D* and to support the rubber buffer *F* and its plate. To the punch-holder is attached the cam-faced pillar *B* which actuates lever *A*.

The lower member *J* is made of cast iron, and has an arc-shaped slot in which the curl-forming lever *A* operates. There is a vertical bore through this slot in which the pillar *B* operates. A drilled hole passes horizontally through block *J* and at right angles to the slot to receive the pin on which forming lever *A* is pivoted.

In operation, the work *X* is placed on the die face, being located by the pin in the loose block *E*. The press ram is then tripped, causing punch-holder *H* to descend and pressure pad *D* to come in contact with the work. Further downward motion of punch-holder *H* compresses buffer *F* and allows the cam-faced pillar to operate the curl-forming lever *A*. Pressure pad *D* prevents the work from buckling under the end pressure of lever *A*.

In this tool, the diameter of the curl can be controlled by means of the pad *C* and its adjusting screw. When the screw is operated, it raises or lowers the forming lever *A*, which has a limited vertical movement because of its slotted pivot hole. If, on increasing the diameter of the curl, the joint does not meet, the blank is slightly advanced by moving the loose block *E* inward by means of the adjusting set-screw. These adjustments give a range of plus or minus 0.010 inch in the diameter of the curl.

The slotted hole in *A* also has another function. It allows lever *A* to rise slightly after each forming movement, in order to clear itself from the work-piece. The return motion of *A* is produced by a spring and is limited by a stop-pin. E. J. B.



Die for Producing Curled Eye of Accurate Size in End of Mild-steel Strip

Simple Arrangement for Tapping Aluminum Parts

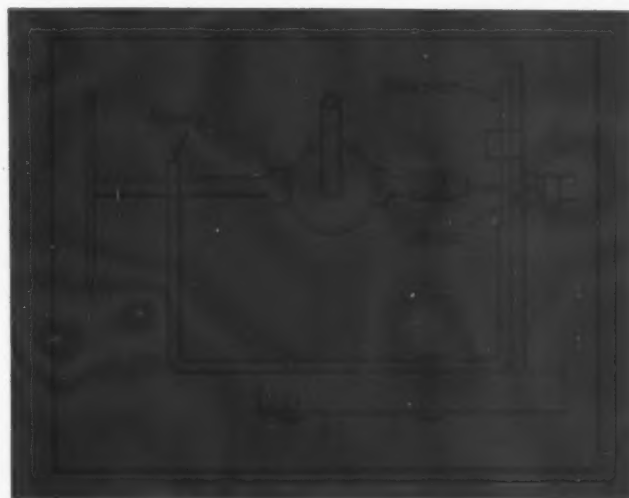
In the accompanying illustration is shown a simple arrangement consisting of a geared hand brace, a tap, a fixture, and an air hose, which was used successfully for tapping thousands of 6BA threads in aluminum alloy parts of varying thickness. This size British Association Standard thread with a radius-formed crest and root has 47.9 threads per inch and is 0.1102 inch in diameter. All holes were tapped with full threads completely through the parts, which had a maximum thickness of 0.300 inch.

In operation, the work-piece is placed in the fixture as indicated, the tap is dipped in a soluble-oil cutting mixture, and the brace and tap placed in the fixture, which locates the tap at right angles to the work while the hole is being tapped. A blast of air at a pressure of 80 pounds per square inch directed along the flutes of the tap serves to

break up and remove the chips as they are formed. With this arrangement, the tapping time is approximately one minute per hole.

* * *

A nation is headed in the wrong direction when it pays premiums for idleness and puts a penalty on hard work, earning power, and thrift. That was not the idea of the men who founded this nation and who faced dangers and hardships to make it the country that it is.



Set-up Used for Hand-tapping Aluminum Parts

Shop Equipment News

*Machine Tools, Unit Mechanisms,
Machine Parts, and Material-
Handling Appliances Recently
Placed on the Market*

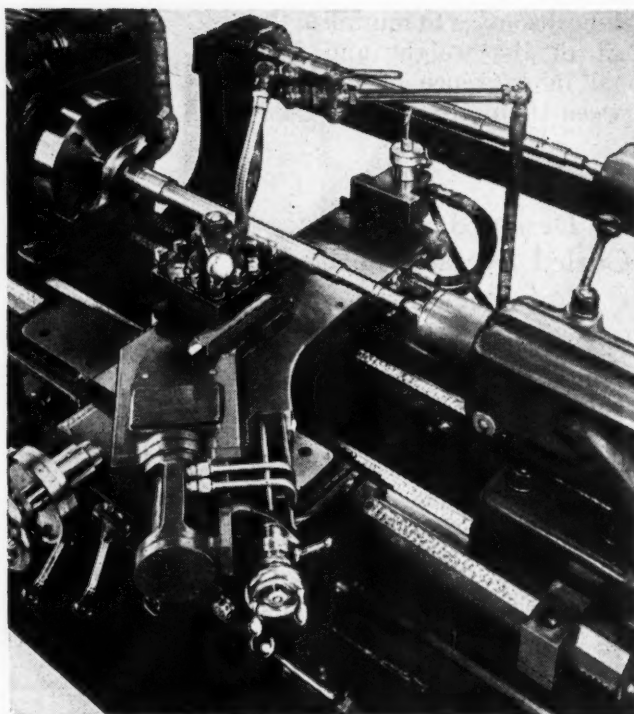


Fig. 2. Close-up View of Hydraulic Duplicating Equipment on Lathe Shown in Fig. 1

American Hydraulic Duplicating Lathe

The American Tool Works Co., Cincinnati 2, Ohio, has brought out a hydraulic duplicating lathe which consists essentially of an American "Pacemaker" lathe with a built-in specially designed new model Turchan hydraulic duplicator. This du-

plicating lathe has been developed for the rapid and accurate reproduction of spindles, motor shafts, piston rods, and similar work, using a templet or master part mounted on a holder attached to the rear of the lathe. It will machine shafts having

irregular contours, including steps, tapers, right-angle or tapered shoulders, recesses, grinding necks, and radii-formed surfaces.

A templet made from a piece of sheet metal can be used, but it is preferable to employ an original of

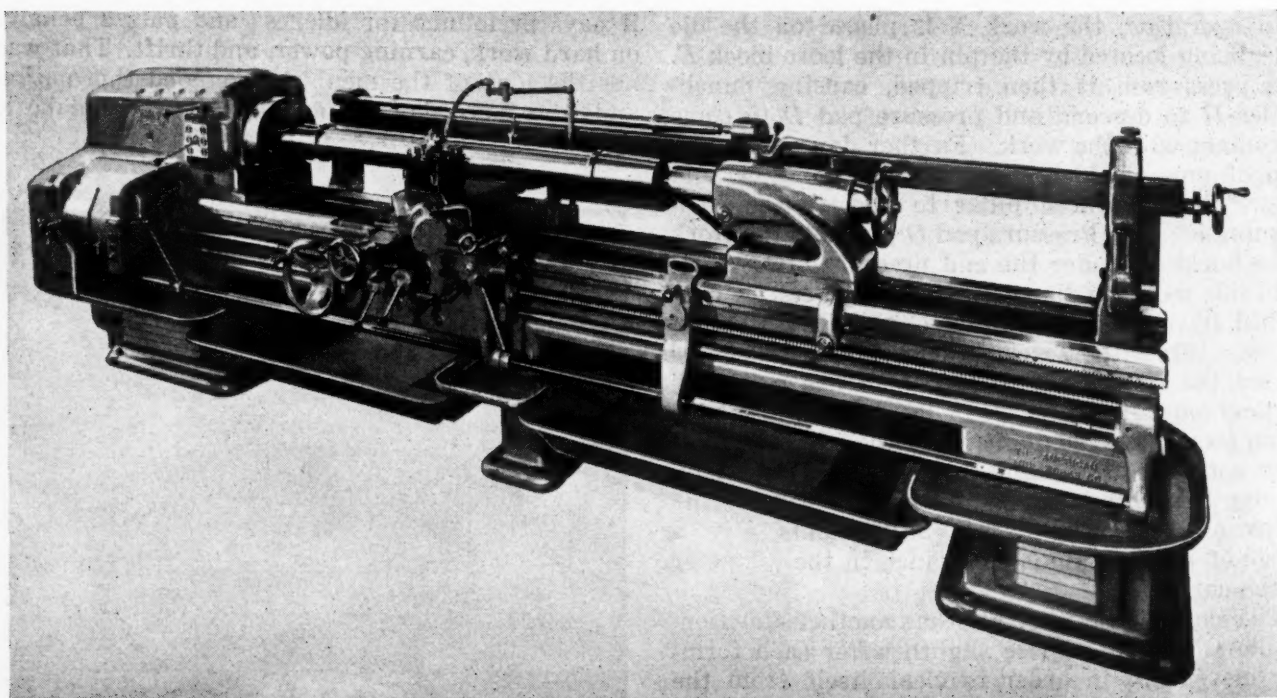


Fig. 1. Hydraulically Operated Duplicating Lathe Brought out by the American Tool Works Co.

the shaft or work to be reproduced as a master. When a shaft is employed as a templet or master, it is mounted between the centers of the adjustable templet supports. If a sheet-metal templet is used, it is located on a holder attached to the templet support bar.

The outstanding advantage claimed for this machine is its ability to produce duplicate work at exceptionally low cost. It will cut metals at the speeds and feeds required for cemented-carbide tools. Variation of spindle speed is secured through the standard geared-head transmission, and variation of feed through the quick-change gear mechanism.

Another important advantage of this machine is its extreme simplicity, there being no stops to adjust, no multiple tooling to set, and no electrical equipment to keep in operating condition. The lathe will cut metal continuously, and need not be stopped for measuring or calipering work. Measuring is confined to the first diameter machined, after which all other diameters are finished to size automatically.

The compact hydraulic equipment of this lathe consists primarily of a motor-driven hydraulic pump which supplies the hydraulic operating pressure, and a hydraulic tracer valve which meters the oil directly to the piston which in turn controls the movement of the cutting tool slide. The pump unit is usually located on the floor at the rear of the lathe, and the fluid, under a pressure of 300 pounds per square inch, is piped to the small cylinder attached to the tool-slide.

The tracer valve is mounted on an independent slide, the movement of which is controlled through a screw and nut by means of the small handwheel at the right of the tool-slide. This positioning of the tracer valve is the means by which the relationship between the tracer point and the cutting tool is changed for varying the depth of the cuts. A micrometer dial, graduated in thousandths of an inch, is located on the adjusting handwheel to facilitate machining the work accurately to size.

A sensitive, manually controlled lever effects the quick advance and return of the tool-slide. This lever can be used at the end of a cut or whenever the operator desires to quickly withdraw the tool from the work. The withdrawn tool-slide can then be held in the retracted position by hydraulic pressure until the operator, by moving the control lever in the opposite direction, causes the slide to advance until the tracer point

again comes in contact with the templet or until the slide reaches its forward travel limit.

The maximum turning capacity of the 16-inch hydraulic duplicating lathe is 4 inches, and of the 20-inch size, 8 inches. Care must, of course, be used in selecting the type of templet employed for different kinds of work. It is conceivable, especially when using the 20-inch size lathe, that an ordinary work-piece, if employed as a templet, would be too heavy to be supported between the templet holding centers. This limitation is encountered only when maximum work diameters are to be reproduced or when the work is of excessive length. For example, the piston-rod shown being machined in Fig. 1 is 6 7/8 inches in diameter by 78 inches long and weighs over 800 pounds. It is obvious that this piece is too heavy and would be too awkward to be used as a templet. In such cases a reduced-diameter templet such as shown between the templet holding centers should be used.

The templet supporting bar is adjustable lengthwise by means of a

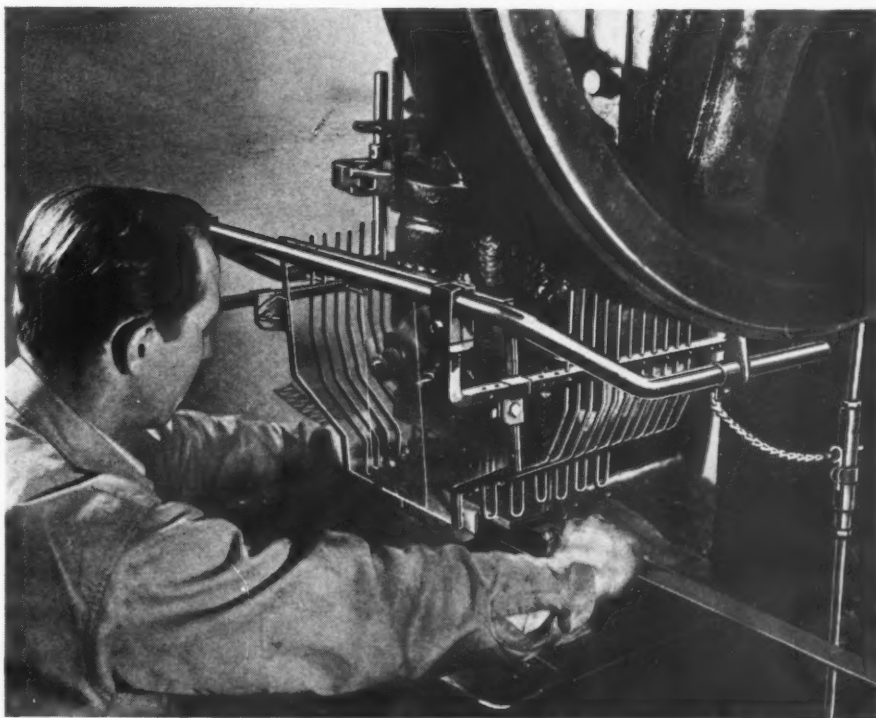
handwheel at its right-hand end. This adjustment is provided to compensate for variations in center-hole depths in the work and to permit convenient alignment of the templet with the work when setting up the machine. The slide on which the cutting tool is mounted is designed to operate at an angle of 45 degrees to the work axis. This arrangement compensates for the longitudinal movement of the carriage in such a manner as to permit the reproduction of perfectly square shoulders, as well as radii and bevel-formed surfaces. Without this compensating factor, square shoulders could not be reproduced with the single hydraulic control of the tool-slide unless the longitudinal feed of the carriage was stopped.

In order to use this hydraulic duplicating lathe as a conventional or standard engine lathe, it is only necessary to remove the templet, and by means of the control lever, locate the tool-slide in its full forward or "in" position, where it is held against the cutting thrust by the hydraulic pressure in the cylinder.....61

Junkin Safety Guard for Power Presses

A safety guard for power presses incorporating several unique features has been brought out by the Junkin Safety Appliance Co., Inc., 930-936 W. Hill St., Louisville 8, Ky. This guard is adjustable both

vertically and horizontally to suit all dies which can be accommodated by the press. It has also been designed for use on both front- and side-fed blanking operations. The double pivot mounting bracket makes it



Press Equipped with Safety Guard Made by Junkin Safety Appliance Co., Inc.

possible to pull the guard straight forward from its set position and swing it completely out of the way without changing the adjustment or the die set-up. Once the gate is out of its guarding position it is impossible to trip the press until the guard is swung back in place and the key attached to the chain has been replaced in the split lock connection of the pedal-operated tripping rod.

The splinter-proof, telescoping, transparent, plastic front shield af-

fords an unobstructed view of the operating zone. The individual formed-wire side shields permit the operator to work safely close to the die. These wire shields can be raised or lowered as desired. Individual wire shields can be removed or added to the guard as needed. The guard is built to fit any press, and is provided with simple universal mounting brackets which permit the complete unit to be easily installed and adjusted.62

Bullard Man-Au-Trol Spacer

Rapid positioning of duplicate work with exceptional accuracy for the drilling, boring, reaming, and tapping of holes without the use of jigs, and at considerable saving in time, is possible through the use of the "Man-Au-Trol Spacer" recently developed by the Bullard Co., Bridgeport 2, Conn. This new hydraulically operated, precision locating device is designed for use on radial and other types of drilling machines. It is now made in two sizes, the larger size (shown in the illustration) being adapted for use on radial drilling machines, while the smaller size is intended for use with sensitive drill-

ing machines. The spacer will, however, be made in a variety of sizes, with work-carrying tables as small as 7 inches square and in large sizes capable of handling massive work.

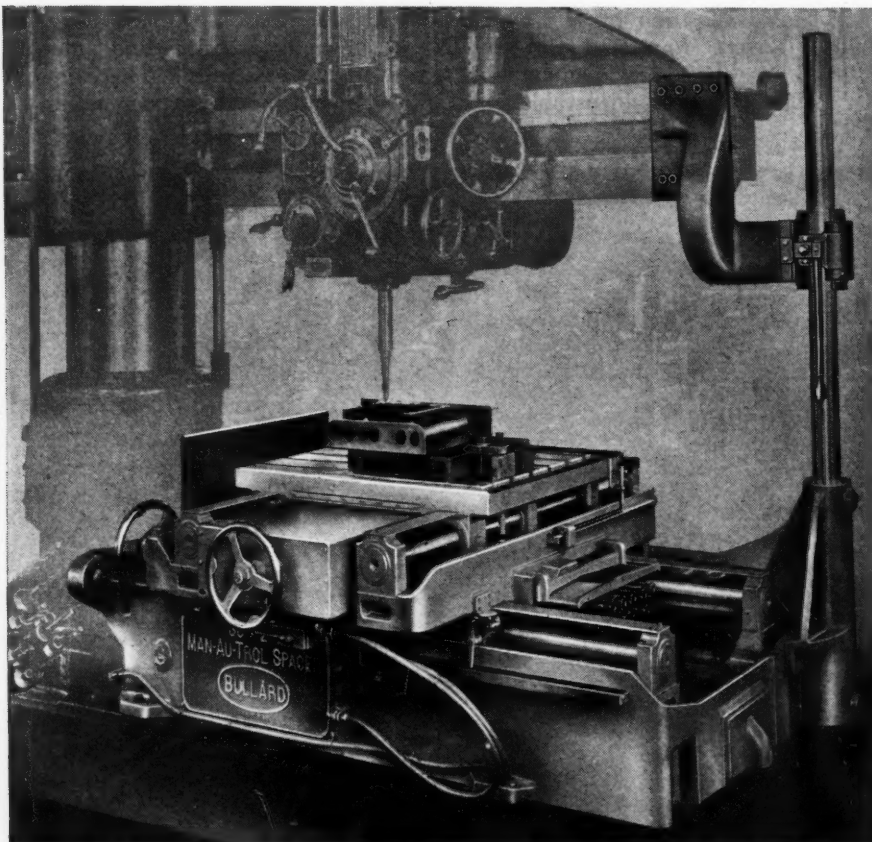
The Man-Au-Trol Spacer consists primarily of a work-holding table which is hydraulically movable transversely, and is mounted on a saddle which is hydraulically movable longitudinally along the bed. With this arrangement, work clamped on the table can be hydraulically traversed from one predetermined position to another by two selector controls, one for lateral positioning and the other for longitudinal positioning.

Settings are rapidly and easily made by the adjustment of screws which control the multiple longitudinal and cross positions of the table. When once set, the platen will constantly repeat or duplicate its prearranged settings. Shifting the table from one position to the next is readily accomplished by rotating the two selector control handwheels to the dial readings corresponding to that setting for the table. These handwheels control, respectively, the lengthwise and crosswise motions of the table.

Each longitudinal and each transverse motion is produced by an individual hydraulic cylinder. Thus, with ten cylinders available for longitudinal movement of the work and ten cylinders for transverse movements, it is possible to locate the work in one hundred different positions by simply setting the selector dials that determine which cylinders are to receive hydraulic pressure. The table is located in each predetermined position by the pair of cylinders selected to give the required movements to the table. Each cylinder has a corresponding adjustable stop against which the table is positively locked by the action of a master control piston. Separate master control pistons are employed to insure positive and uniform locking of the table in the positions determined by the stops for the transverse and for the longitudinal movements.

The table is provided with alphabetically arranged stops or stop designations, and the transverse movement control dial with corresponding designations, which is located directly in front of the operator, can be instantly set to control the hydraulic circuits which cause the table to move transversely in either direction to the stop selected. The saddle is provided with numerically designated adjustable stops which are used in positioning the table longitudinally. The longitudinal control dial, also with corresponding designations, is located slightly to the left of the operator's position. This dial can be instantly set to control the hydraulic circuits which move the saddle longitudinally in either direction, as required to locate the table in the exact predetermined position for which the selected longitudinal stop has been set.

Once the stops have been set to correspond to the ordinates of the various holes in the piece to be drilled, the positioning of the table is controlled entirely by the two dials. Thus the table is automatically posi-



Bullard Man-Au-Trol Spacer Developed for Rapid Drilling of Accurately Spaced or Positioned Holes without Use of Drill Jig

tioned by simply moving the dials to the respective numerically and alphabetically designated positions corresponding to the settings for the particular hole selected for the drilling or other operation.

This equipment can also be used for final inspection of the work. Where the layout of holes is complex,

the inspector can first piece-check the job right on the table, re-checking the platen settings with end measures, and then successively tramming around test bars set in the machined holes by means of a dial indicator mounted on the machine spindle, thus eliminating elaborate inspection set-ups on a surface plate.....63

as when held in the left-hand carriage. After the latter threading operation, the nipple is discharged from the machine.

The machine is driven by a constant-speed motor, change-gears being provided to give the required spindle speeds for the different sizes of pipe threaded. A safety clutch is built into the drive to prevent serious damage in the event that a "jam" should occur. The drive and cam mechanisms are enclosed, and lubrication devices are provided for all bearings. 64

Automatic Nipple Threading, Reaming, and Chamfering Machine

The Landis Machine Co., Waynesboro, Pa., has developed a machine for automatically threading, reaming, and chamfering both ends of space nipples. This machine is built in two sizes—the 1 1/4-inch machine for handling 1/2-, 3/4-, or 1-inch pipe sizes, and the 2-inch machine which accommodates 1 1/4-, 1 1/2-, or 2-inch pipe sizes.

The 1 1/4-inch machine can be equipped to handle any one diameter of pipe or, if required, combination equipment can be furnished for both 1/2- and 3/4-inch pipe sizes. Combination equipment for the 1-inch pipe size cannot be furnished. Nipples ranging from 2 to 6 inches in length can be machined on the 1/2- and 3/4-inch sizes, and 2 1/2- to 6-inch lengths on 1-inch pipe sizes. The 2-inch machine can also be equipped to handle any one diameter of pipe or, if required, combination equipment can be supplied to take 1- and 1 1/4-inch pipe sizes and 1 1/2- and 2-inch pipe sizes. Other combinations of pipe sizes can also be furnished. The lengths of nipples handled are from 2 1/2 to 6 inches on 1-inch pipe sizes, and 3 to 6 inches on 1 1/4- to 2-inch sizes.

These automatic machines have two spindles, each equipped with Lanco internal-trip semi-receding pipe and nipple threading die-head and reaming attachments. The two carriages have air-operated vises for gripping the nipples, and the left-hand carriage carries an adjustable magazine from which the blanks are automatically fed into the machine.

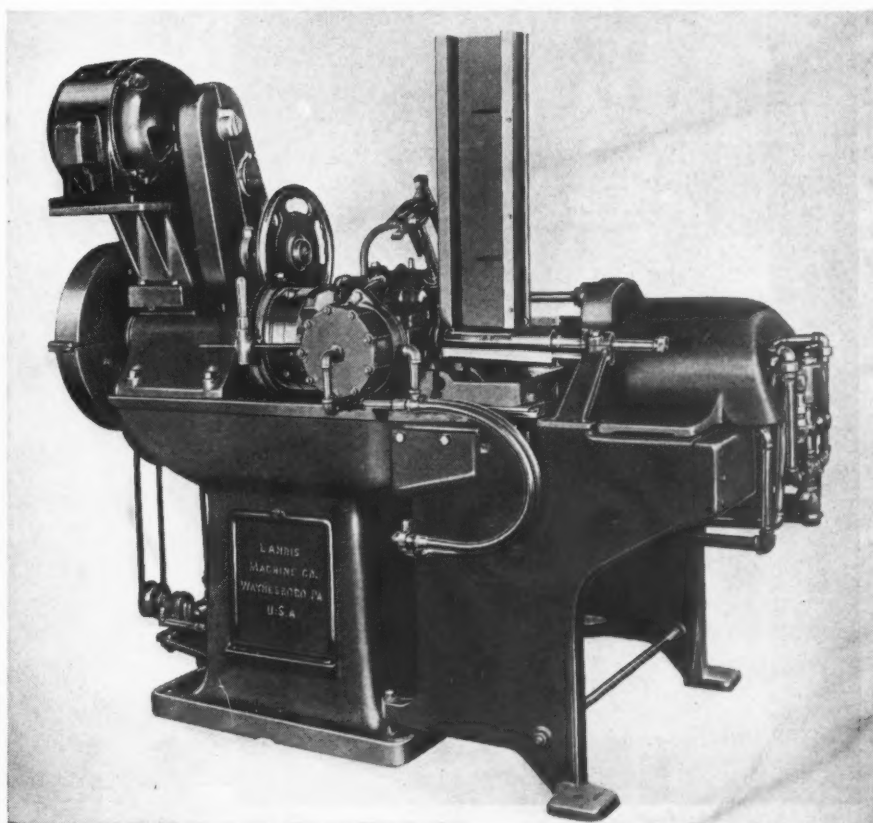
In operation, the nipple blanks, cut to the desired length, are placed in the magazine on the left-hand carriage, where they are fed into the machine, one for each cycle. After being released from the magazine, the nipple blank is pushed into position in the grips, following which the air vise closes to hold the blank in position and prevent it from turning. The left-hand carriage advances rapidly to the thread starting position, and then assumes a feed rate of travel which produces the required

thread lead, the entire carriage movement being controlled by an accurately machined cam.

After the required length of thread is cut and the chamfering and reaming operations have been completed, the left-hand die-head and air vise open automatically and the carriage returns to the loading position. At this time the cam-controlled air-operated transfer mechanism removes the semi-finished blank from the left-hand carriage and places it in the loading position for the right-hand carriage, turning the nipple end for end as it moves it into position over the second carriage. The semi-finished nipple is then pushed into position in the air vise of the right-hand carriage, where it is gripped for reaming, chamfering, and threading in the same manner

Kennametal Composition for Precision Boring Tools

Kennametal, Inc., Latrobe, Pa., has developed a very hard Kennametal composition designated Grade K5H for small tools used in the precision boring of steel parts. It has a Rockwell A hardness of 93.2, great resistance to cratering (high content of tungsten-titanium carbide), and is said to be unusually strong for such a hard material. Solid tools 3/32 to 5/16 inch in diameter and 5/32 to 5/16 inch square are available, as well as blanks 3/32 to 3/8 inch in diameter and 3/16 to 3/8 inch square, suitable for grinding to any desired tool-point shape.....65



Landis Automatic Nipple Threading, Reaming, and Chamfering Machine

To obtain additional information on equipment described on this page, see lower part of page 212.

Watson-Stillman Metal-Forming Press

A single-action press of 100-ton capacity has been added to the line of metal-forming presses built by the Watson-Stillman Co., Roselle, N. J. This press is designed to permit the use of various controls, so that correct metal-forming methods can be employed for any job handled. Provision is made for both manual and automatic single-cycle operation, with reversal controlled either by pressure- or position-actuated devices. Inching control is available for die setting, and a full range adjustment control of the pressing speed is provided.

The press is equipped with a special system for obtaining a rapid traverse stroke. It also has a cooling system for maintaining oil at the proper operating temperature. Standard equipment includes two radial piston type pumps connected to a 100-H.P. double-end ball-bearing motor. Operating speeds are at the rate of 775 inches per minute for the advance and return movements and 225 inches per minute for pressing. A die cushion is optional equipment.66



Single-action Metal-forming Press Built by the Watson-Stillman Co.

Fellows Lead-Measuring Instrument for Checking Helical Gears

The Fellows Gear Shaper Co., Springfield, Vt., has recently placed on the market a No. 12-H lead-measuring instrument designed for checking the lead of helical gears. The new instrument can also be used for other inspection operations, such as checking the taper and crowning of spur and helical gear teeth. In this instrument, the lead of the helix is checked by the continuous traversing motion of a measuring pointer operating simultaneously and in conjunction with the rotating work. If the work being checked is of the correct lead, the dial indicator will remain stationary. If there is an error in lead, the indicator needle will show the amount of error to 0.0001 inch over the face width of the gear.

The operating mechanism comprises two tangent bars and pins, both of which are arranged to operate slides. One of these slides effects the transverse movement of the member carrying the measuring pointer, and the other the rotation of the work. The contact positions of the pins on the tangent bars are set by

means of size-blocks and micrometers, dial indicators being provided to make certain that uniform setting pressure is accurately maintained. Errors in the gears tested can be checked by using the dial indicator carried on the measuring slide or a chart can be made for a permanent record.

The electrical recorder shown in Fig. 3 is an integral part of the measuring instrument which automatically produces a record of the displacement of the tooth face on a paper chart. The chart is provided with horizontal lines, the heavy lines being located 1/2 inch apart and representing 0.001 inch movement of the measuring pointer. Semicircular lines on the chart, also spaced 1/2 inch apart, represent 0.200 inch on the face width of the gear, so that for a gear 1 inch in face width, the length of the charted line would occupy five spaces or 2 1/2 inches. The spaces between the heavy lines are subdivided into five spaces. It is possible to analyze a chart and accurately determine the amount of

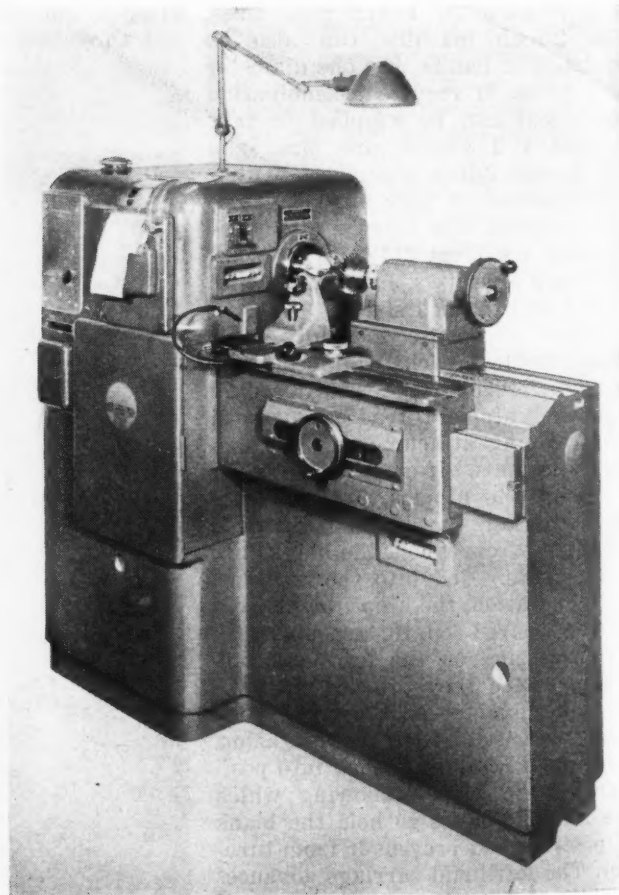


Fig. 1. Fellows Helical-gear Lead-measuring Instrument with Electrical Recorder

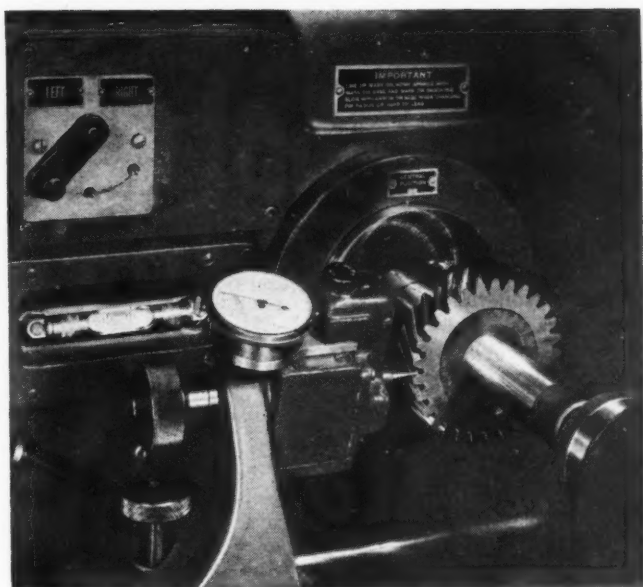


Fig. 2. Close-up View of Lead-measuring Instrument Shown in Fig. 1, Set up for Checking Right-hand Helical Gear

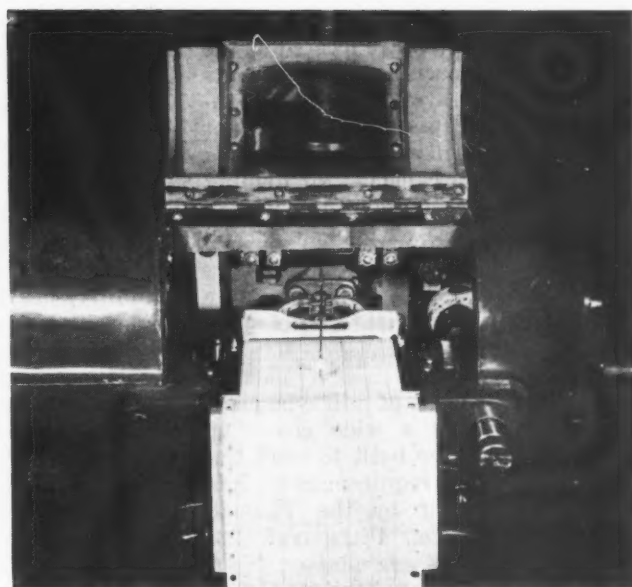


Fig. 3. Close-up View of Electrical Recorder for Charting Errors in Lead of Helical Gears and Other Surfaces

displacement of the tooth face over the face width of the gear being measured, the space between the individual fine vertical lines on the chart representing 0.0002-inch movement of the measuring pointer.

The contact points of the pins on the tangent bars are independently adjustable, making it possible to have transverse movement of the measuring pointer without rotation of the work, and rotation of the work without transverse movement of the measuring pointer. This feature serves to greatly increase the possible range of applications. The instrument is so designed that it can be easily set up and checked for accurate functioning. It has a capacity for checking gears up to 12 inches pitch diameter, and a measuring slide movement of approximately 10 inches...67

Texaco Improved Cutting Oils

A new series of transparent cutting oils, which are pale in color, of pleasant odor, and non-corrosive, have been developed by the Texas Co., 135 E. 42nd St., New York 17, N. Y., for use in the high-temperature machining of metals. These products,

known as "Cleartex" oils A, A-1, B, DD, and Britex oil B, now contain certain war-restricted ingredients that greatly improve their color and performance. All oils in this series contain a combination of sulphur and chlorine. Addition of the new ingredients is said to make possible higher machining speeds without danger of corroding finished or semi-

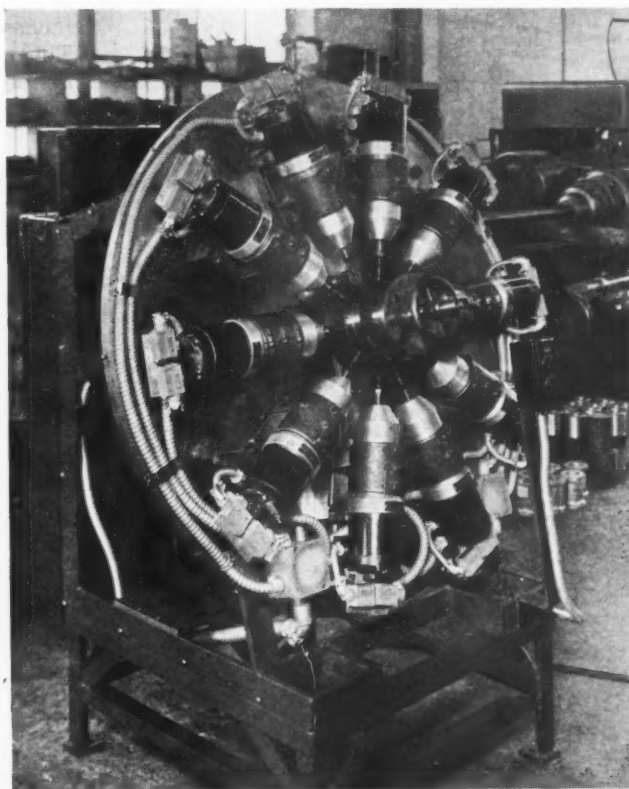
finished surfaces, particularly those of non-ferrous metals such as brass and copper. 68

Simplex Brake-Band Drilling Machine

The Simplex Tool Engineering Co., Detroit 1, Mich., has designed a special high-production machine for drilling twenty holes in transmission bands and linings in one operation. The band and lining to be drilled are clamped manually in the work-holding fixture of the machine, which is shown in the illustration with the cover removed.

After clamping the work in the fixture, the operator simply pushes the starting button. The fixture, which is positioned by air cylinders, moves automatically to the first position, where the drill units, which are provided with automatic forward and reverse movement for the drill spindles, complete the drilling of ten holes. The fixture then moves to the second position, where ten more holes are drilled. At the end of the operation, the fixture returns to the unloading position.

All movements are fully automatic, and electrical interlocking controls are



Brake-band Drilling Machine Built by the Simplex Tool Engineering Co.

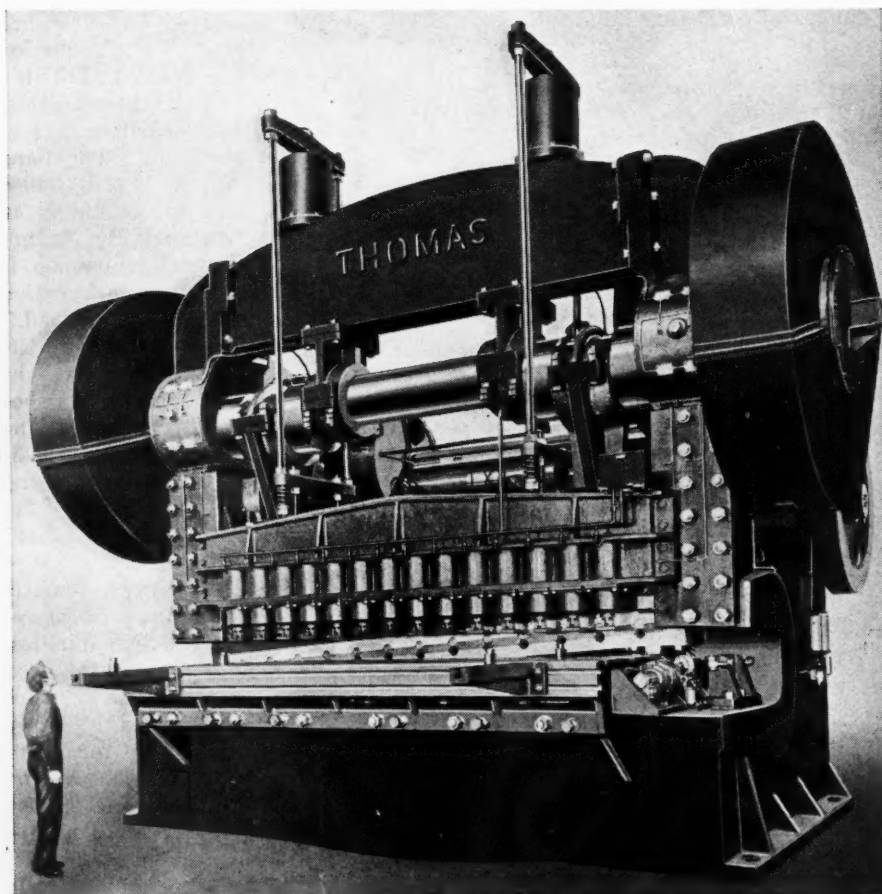
To obtain additional information on equipment described on this page, see lower part of page 212.

provided. The starting button and a master stop-button are located at the front of the machine. All elements of the control system are fully enclosed and operate on a 110-volt pilot circuit. The drill units used on this machine have a capacity for drilling holes of any size up to 11/32 inch in diameter.69

Thomas Mill Type Plate Shears

An improved line of mill type plate shears, including a wide range of sizes which can be built to meet the user's specific requirements, has been brought out by the Thomas Machine Mfg. Co., Pittsburgh 23, Pa. These shears are adapted for a wide variety of applications. The line includes shears capable of cutting plates up to 3 inches in thickness and up to 14 feet in width.

The shear shown in the accompanying illustration is equipped with a twin drive on the main shaft, which serves to reduce torsion. Other features include herringbone gears, a friction clutch, double flywheels, and pneumatic counterbalancing cylinders. 70

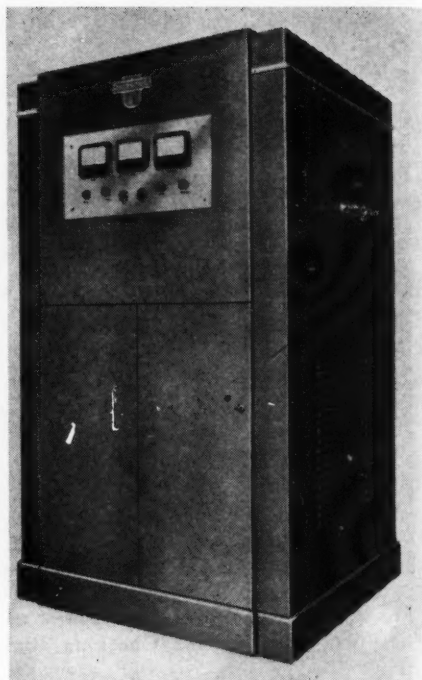


Mill Type Plate Shears Built by Thomas Machine Mfg. Co.

Ther-Monic High-Frequency Induction Heater

A Model 1400 Ther-Monic high-frequency induction heating generator, the largest and most versatile in the line of equipment made by the Induction Heating Corporation, 389 Lafayette St., New York 3, N. Y., has just been announced. Greater flexibility, heavier construction, filament voltage stabilizer, variable output control, circuit-breaker overload protection, water pressure gage, time-delay water system and supervisory pilot-light control are among the features of this electronic generator. Two water-cooled oscillator tubes and six rectifier tubes are used in the heater.

When fully loaded, this unit is capable of delivering an output of 1400 B.T.U. per minute, or approximately 25 K.W. at a nominal frequency of 375 kilocycles. It has a full-load input of 50 K.V.A. at 90 per cent power factor, and operates on a 205- to 245-volt, 60-cycle, three-phase power supply. Provision is made for reducing line voltage of 550 or 440 volts used in some plants to 220 volts through the installation of a transformer.



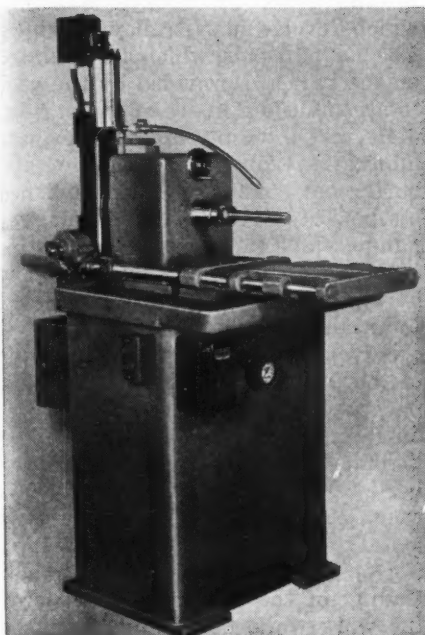
Ther-Monic High-frequency Induction Heater

This unit is designed to provide a versatile source of energy for brazing, soft soldering and fusing, as well as for hardening, annealing, tempering, stress relief, forging, melting, shrink fitting, and expanding. The steel cabinet of this generator is 42 3/4 inches wide, 39 1/4 inches deep, and 73 3/4 inches high. The complete unit weighs approximately 3700 pounds.71

Ampco Welding Electrode

A new coated beryllium-copper electrode known as "Beryl-Trode" has been added to the line of welding electrodes placed on the market by Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4, Wis. This electrode has a medium-weight flux coating for stabilizing the arc; forms flux oxides in the welding operation; and produces a dense deposit. It can be used with either the metallic- or carbon-arc process, and is designed to weld parts made of beryllium-copper, such as resistance welding jaws, seam-welder wheels, etc. The deposits, when heat-treated, develop high hardness and high strength values approximately equal to those of the base metal.

The electrodes are used for joining parts, repairing cracks or defects in castings, and building up worn surfaces. They are made in diameters of 5/32 and 3/16 inch, and in 14-inch lengths.72



Automatic Honing Machine Built by
Staple Engineering Co.

Semi-Automatic Honing Machine

The development of a Model "B6" semi-automatic honing machine has just been announced by the Staple Engineering Co., 1315 S. Woodward Ave., Birmingham, Mich. This new machine will hone parts having inside diameters ranging from 1/4

inch to 2 1/2 inches. It has a 7-inch stroke, is manually adjusted for size, and is electrically controlled and air operated. The honing cycle is adjustable from 3 seconds to 180 seconds and the speed from 40 to 180 strokes per minute.

The Staple two-stone honing mandrel used on this machine is said to be capable of producing 10,000 to 30,000 parts. Suitable stones can be supplied for honing most materials. The honing cycle is entirely automatic. After placing a part in the work-holding fixture (not shown), the operator simply presses a but-

ton; the work-table then advances to the honing position, the stroking operation begins at the pre-set time, and the table finally returns to the unloading position. Thus one operator can care for more than one machine.

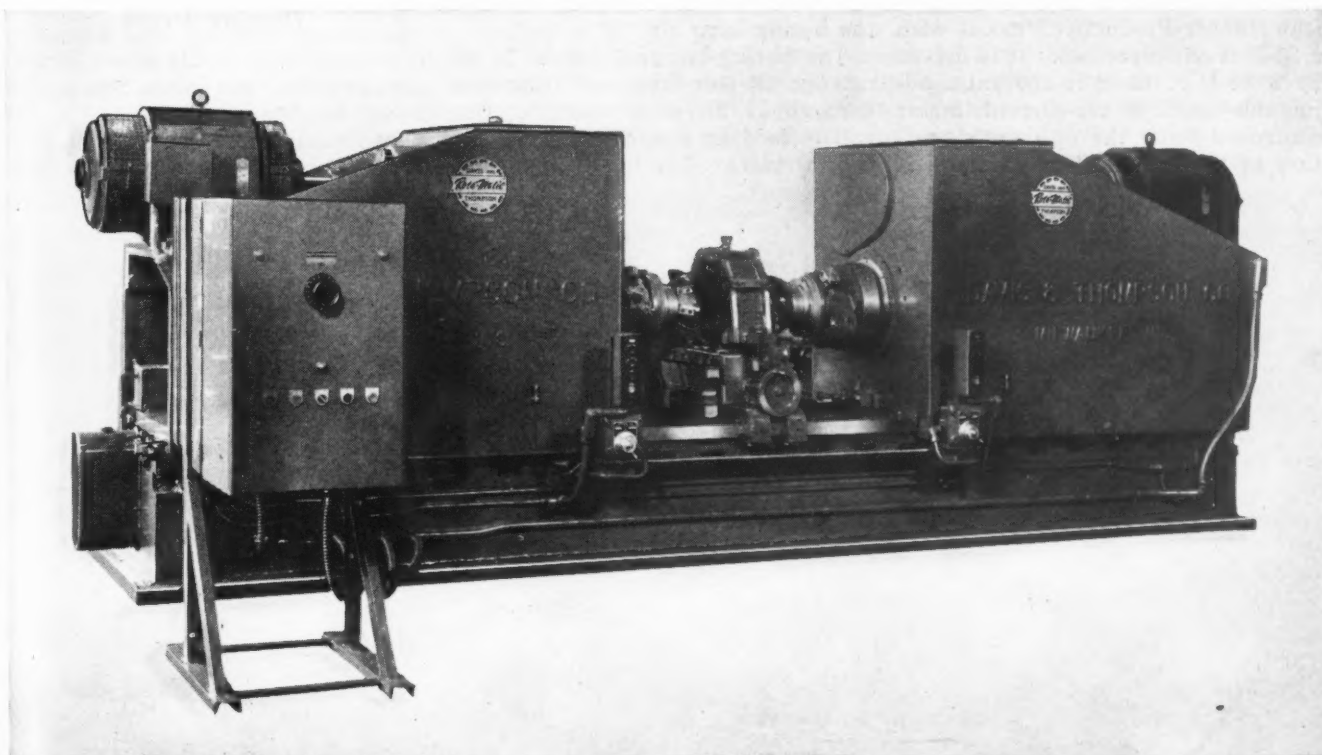
Some of the advantages claimed for this semi-automatic honing machine include economy through faster stroking, which means more parts per minute; one operator can run several machines at the same time; and the machine enables honing operations to be performed by unskilled operators who merely load and unload the work.73

Davis & Thompson Double-Head Machine for Boring Electric Motor Frames

Boring, facing, chamfering, and counterboring operations can be performed on electric motor frames in one set-up on a two-way type two-head boring machine recently brought out by the Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis. Hydraulic power, controlled either electrically or manually, is employed to actuate the feeding cycle of this machine. Two 15-H.P. direct-current, variable-speed motors, one on each head, operate the spindles. Spindle speeds are variable from 80 to 320 R.P.M. One 10-H.P. motor operating at 1200 R.P.M. drives the two Vickers pumps which supply

power to the hydraulic system. The feeds, which range from 1/4 inch to 7 inches per minute, are operated hydraulically through a two-speed gear-box. Rapid traverse and return feeds are at the rate of 200 inches per minute.

The cycle of operations is commenced by starting the right-hand spindle at the correct boring speed under the control of a rheostat. The head is rapid-traversed to the work, after which pressure on a manually operated button throws out the rapid traverse and engages the previously selected head feed for rough-boring to a positive stop.



Machine with Double Opposed Heads for Boring Electric Motor Frames, Made by Davis & Thompson Co.

To obtain additional information on equipment described on this page, see lower part of page 212.

After the rough-boring operation is completed, the right-hand head is returned under rapid traverse by pressing a push-button. The selector switch is then engaged to actuate the left-hand head and stop the right-hand head, following which the left-hand head is rapid-traversed to the cutting position, where it assumes the correct cutting feed for the finish-boring operation. Push-button control is furnished for this operation, in which the head feeds through to a permanent stop. This arrangement then allows the rough-facing, chamfering, and rough-counterboring tools to perform their respective functions. After these operations have been performed, the operator presses a button which causes the left-hand head to return to its starting position.

The right-hand head is then brought forward through rapid traverse to perform its rough-facing,

chamfering, and counterboring operations. While these operations are being performed, a guide ring automatically enters the finished bore to stabilize the tools and eliminate any possibility of chatter. Roughing tools are then set back on the left-hand head, leaving the finishing tools to perform the finish-facing and boring operations. After this has been accomplished, the same operations are performed on the right-hand head. Coolant is fed to the work during all operations. The cycle of operations described can be completed on a Size 254 motor frame in five minutes.

The cutter-spindles of this machine are 12 inches in diameter and are mounted in taper bearings. These heavy spindles, together with the single set-up and the use of automatic stops, are claimed to insure uniform work and to practically eliminate error on the part of the operator. 74

in the rests by bronze bushings which revolve in Nitralloy bearings. The boring heads, which are mounted on the bar, are provided by the user to accommodate liners of the various diameters to be machined. Adequate lubrication for the carriage and boring-bar rests is accomplished by powerful lever-operated plunger pumps which force copious quantities of oil to all bearing surfaces. The boring-bar bearings are lubricated by means of sight-feed oilers.

Advantages claimed for this type of boring equipment include comparatively low initial cost; fast production obtained by using cemented carbide cutters in rigidly supported boring heads; high degree of accuracy, which reduces the amount of metal to be removed by the final honing operation; easy loading and unloading of the work; better view of the work while performing the boring operation; convenient and easy operation obtained by concentration of controls at the apron; and use of a rigid 2400-pound boring-bar, which remains mounted in the lathe and does not have to be removed and re-mounted when unloading and after loading the work. Loading and unloading of the work are accomplished without interference with the boring-bar by running the work carriage to the extreme right-hand end of the lathe bed. 75

American Cylinder-Liner Boring Lathe

The American Tool Works Co., Cincinnati 2, Ohio, has just built a cylinder-liner boring lathe for one of the largest manufacturers of Diesel engines in this country. This new equipment has the capacity required for finish-boring cylinder liners up to 28 inches in diameter. It is essentially a larger model of similar lathes previously brought out by this company.

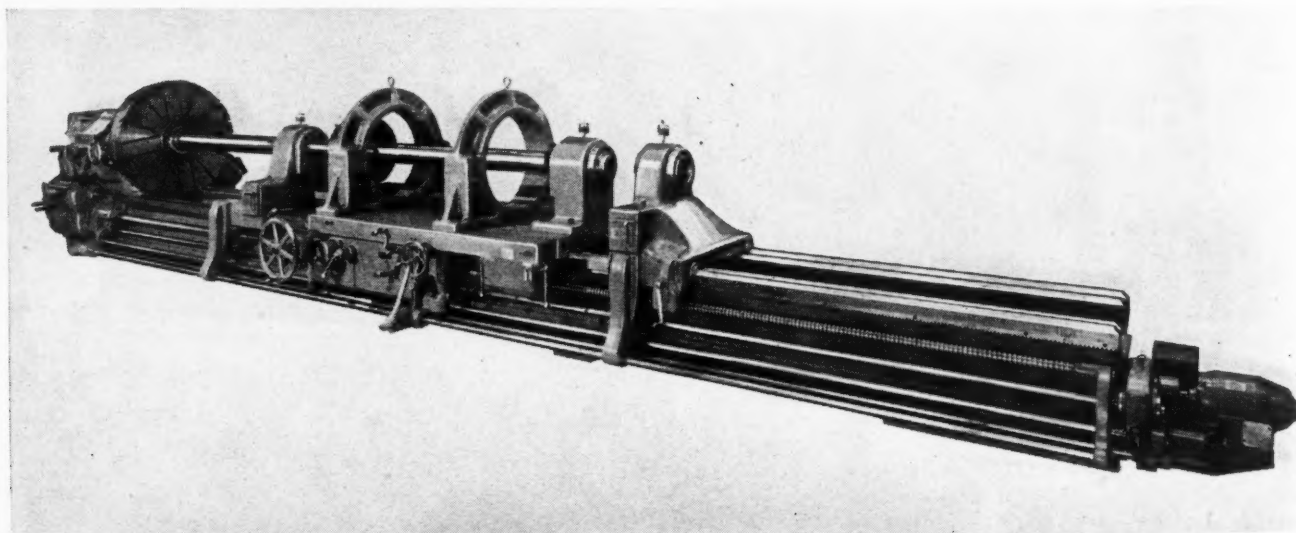
The lathe itself is a 48-inch American "Super-Productive" model with a 34-foot one-piece bed. It is driven by a 30-H.P. three-to-one ratio adjustable-speed direct-current motor controlled from the operator's position at the apron. The carriage is

in the form of a large platen on which are mounted two large work-holding rests and a boring-bar support. Accurate alignment of the carriage is maintained by taper gibs under each of the four vees of the bed. Filler blocks for the work-supporting rests can be provided by the user to accommodate liners of various diameters. The bed is independently mounted, and additional front and rear supports are provided for the boring-bar.

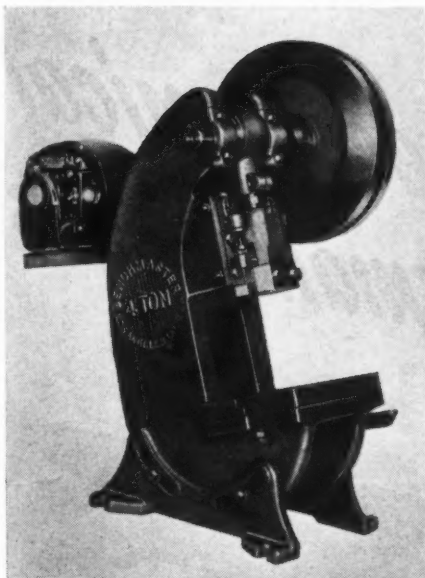
The boring-bar is 7 inches in diameter, 19 feet long, and is ground throughout its entire length. One end is held in a driver attached to the faceplate. The bar is supported

Benchmaster Bench Type Punch Press

An improved model of an unusually compact 4-ton bench type punch press is being produced by the Benchmaster Mfg. Co., 2952 W. Pico Blvd., Los Angeles 6, Calif. This



Lathe Built by the American Tool Works Co. for Boring Large Diesel-engine Cylinder Liners



Bench Type Punch Press Made by
Benchmaster Mfg. Co.

press, weighing only 215 pounds, operates at a speed of 285 R.P.M. with a 1725-R.P.M. electric motor. Outstanding features include a precision-ground shaft that is keyed to a large eccentric with a press fit which offers a shock-absorbing surface having no weak or thin points that are likely to shear or fail. An over-size bronze bushing encloses the eccentric, and full-diameter bronze bushings encase the shaft at points subject to wear. The frames are cast in one piece from semi-steel, heat-treated and heavily reinforced at stress points. These frames are mounted on two supports forming a broad stand cradle, which allows the machine to be inclined.

This press has an open back that makes it possible for work to be inserted from the front, as well as from the sides. A new type floating motor mount which maintains proper tension of the V-belt drive assures maximum power delivery at all times. When the ram is in the up position, a 5 3/4-inch die space is available. The 6- by 8-inch bolster plate has a thickness of 1 inch and a 2-inch hole at the center. The flywheel has a weight of approximately 50 pounds.

Although specifically designed for use as a punch press, this machine is equally well adapted for stamping, marking, punching, riveting, and other high-speed operations.76

Moak Two-Spindle Borer with Movable Head and Adjustable Spindles

A two-spindle boring machine designed for use in the light metal, plastic, furniture, and allied manufacturing industries is being made by the Moak Machine & Tool Co., Port Huron, Mich. The distance between the two spindles in the completely enclosed "Silver Top" radial borer unit of this machine can be adjusted from 1 1/16 to 12 inches. The right-hand spindle is stationary, the left-hand spindle being adjusted to give the required center-to-center distance by movement in a slot, which is kept closed at all times to exclude chips and dust.

The spindles are driven by a silent chain, the speed being variable from 1000 to 4000 R.P.M. The "Silver Top" is made of heat-treated alloy

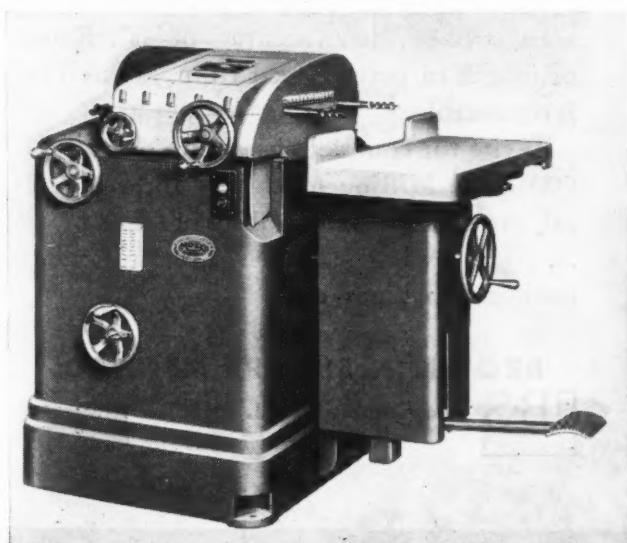
aluminum, and is light enough to permit easy movement of the head to any angle from the horizontal to the vertical, the exact setting being shown by an indicator and pointer.

The work-holding table is moved in a straight line by an ingenious arrangement of a quadrant and cable, operated by a new type of treadle. With this arrangement, the position of the treadle is not changed when the table is raised or lowered.77

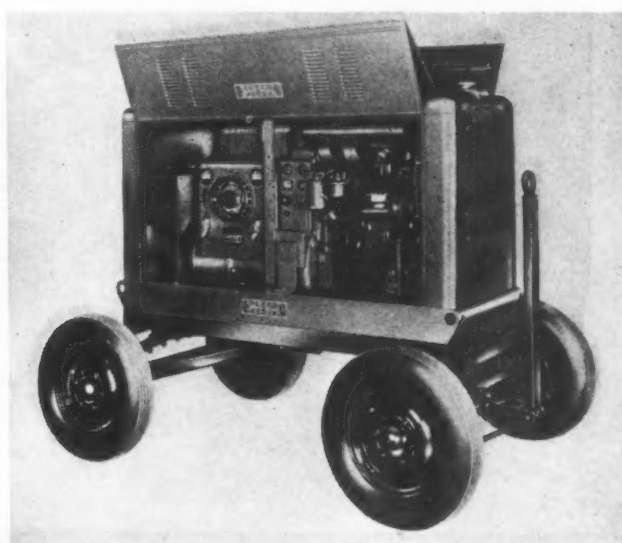
Hobart Arc-Welder with Diesel-Engine Drive

The newest addition to the "Multi-Range" welder line of the Hobart Brothers Co., Hobart Square, Troy, Ohio, is a Diesel-engine driven arc-welder of 300-ampere capacity. This welder is designed especially for use in locations where electric power is not available and it is desired to keep the operating cost at a minimum. Power is furnished by a two-cylinder, unit injection type Diesel engine with oil cooling, displacement blower, and fuel filtration equipment.

The engine, designed to save fuel, has a 4 1/2-inch bore and a 5-inch stroke. It has a rating of 47 H.P. at 1450 R.P.M., and is equipped with patented "Multi-Range" dual control and exclusive remote control which permits the operator to make fine volt-ampere adjustments right at the work. One thousand combinations of voltage and amperage adjustments permit the operator to select exactly the right arc intensity to suit any job. Other features of the welding generator include separate excitation and two-way ventilation.78

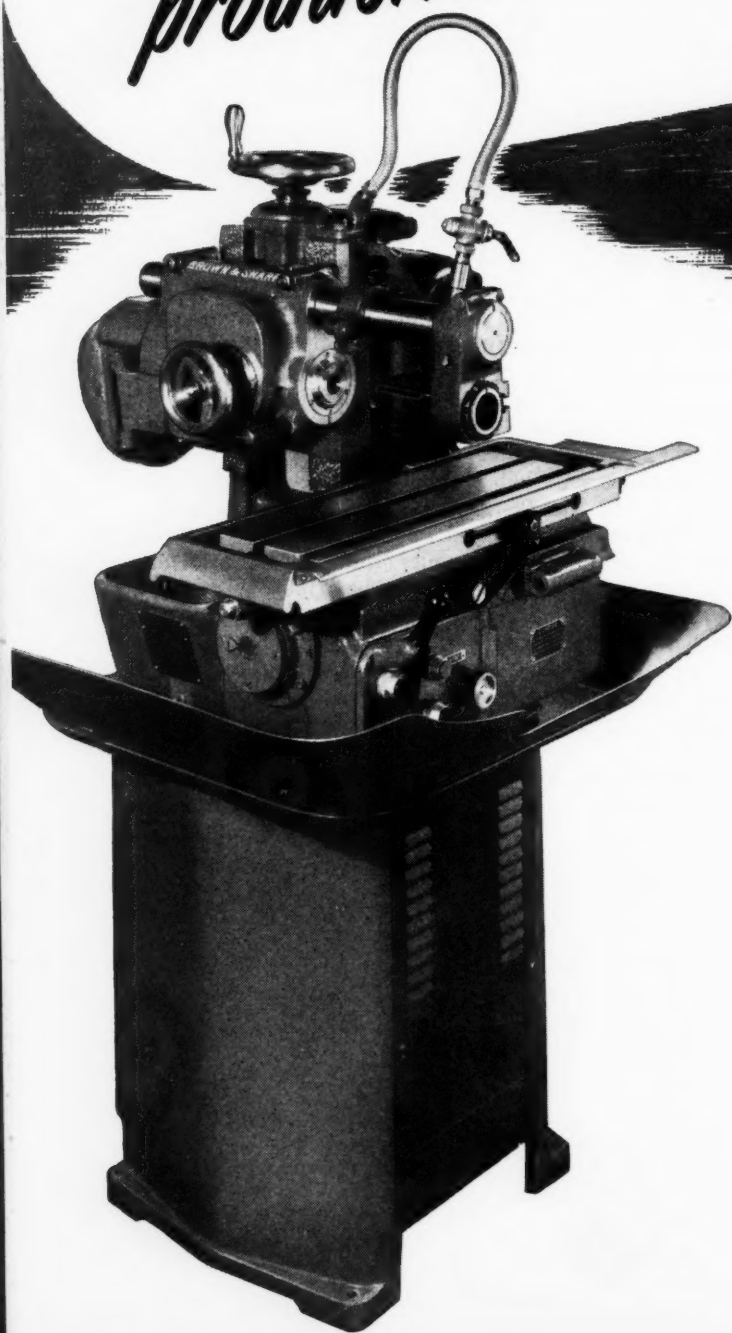


Moak Two-spindle Light Metal Drilling and
Wood Boring Machine



Arc-Welder with Diesel-engine Drive, Brought
out by Hobart Brothers Co.

*Use No. 000 for more economical
production milling of small pieces*



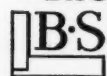
Here's one big reason for the high production record of the No. 000. Minimum time is lost in the work traveling to and from the cutter . . . at fast travel of 365" a minute. At the end of its stroke, table automatically reverses and returns at fast travel to loading position . . . in less than 1½ seconds.

Reversal of table is within an accuracy of .002" . . . an important feature when you're making blind cuts.

Cutting feed engaged at any point in forward stroke . . . to an accuracy of $\frac{1}{16}$ ". Range of length of cutting feed from $\frac{3}{8}$ " to 5½" is obtainable.

Write for complete literature on the No. 000 Plain Milling Machine — for economical, rapid production milling of small pieces . . . for sewing machines, firearms, radio, business machines, etc.

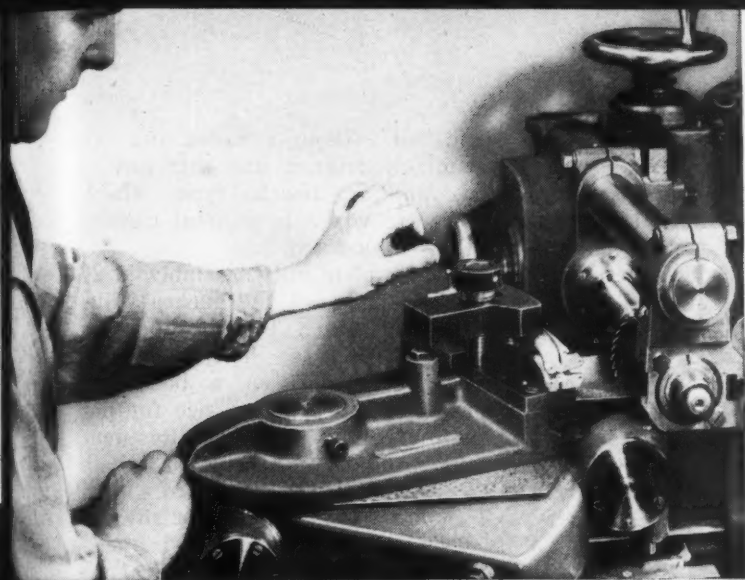
BROWN & SHARPE MFG. CO.



Providence 1, R. I., U. S. A.



BROWN &



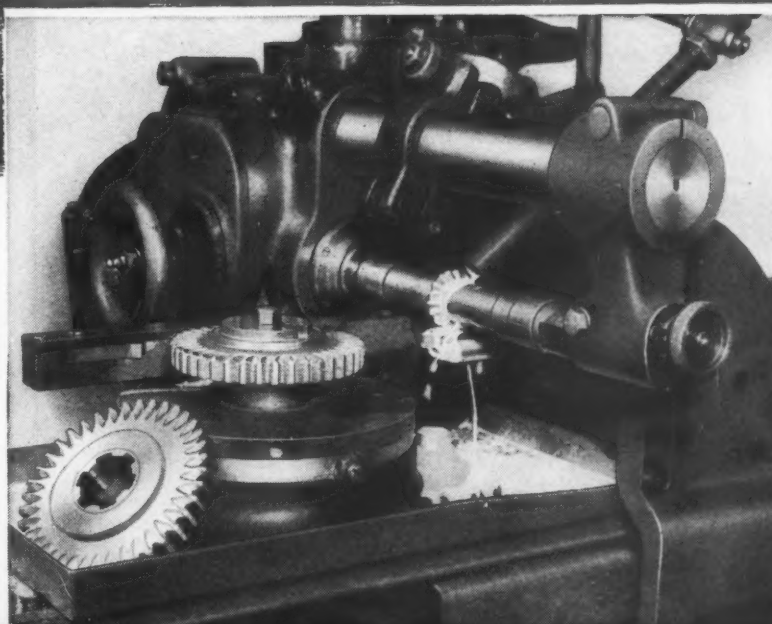
Air-operated indexing fixture mills 42 unevenly spaced slots in two typewriter segments simultaneously . . . cutting of operating cycle.

In milling these two cast iron parts simultaneously, indexing is automatic from cut to cut. When the last slot is completed, the machine table automatically stops in loading position. 83% of operating cycle is cutting time, using $6\frac{11}{16}$ inches per minute feed.

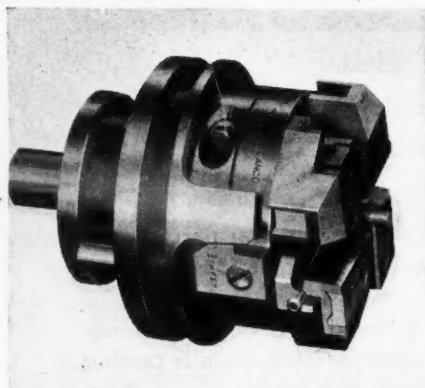
*Get greatest percentage of cutting time
with Brown & Sharpe Designed Fixtures*

Chamfering teeth on steel gears with the
cutter milling of the operating cycle.

This automatic indexing fixture permits a very high percentage (78%) of cutting time within the operating cycle. The cutting feed is $2\frac{11}{16}$ inches per minute. The design of this fixture permits milling a chamfer on gears of various diameters, numbers of teeth, and widths of face with minimum set-up adjustment . . . the indexing being obtained through the gear itself.



SHARPE



"Lanco" Taper-attachment Die-head
Made by the Landis Machine Co.

"Lanco" Taper-Attachment Die-Head

The Landis Machine Co., Waynesboro, Pa., has developed a 9/16-inch "Lanco" taper-attachment die-head having a capacity for cutting 1/8- to 1/2-inch standard pipe threads. This die-head is of the rotary type, and is adaptable to any machine having a lead-screw or lead cam. It can be furnished with a special shank and flange as required for different machines.

Tapered threads are generated with this die-head the same as straight threads, in that they are formed with the chaser throat. This arrangement eliminates chaser "leave-off" marks on the work. The die-head is fitted with alternating-

tooth tangential pipe chasers which are especially adapted for threading stainless steel. The combination of this die-head and alternating-tooth chasers prevents tearing on the crest of the thread, since the chip is formed only on one side angle of the thread. 79

Porter-Cable Belt-Grinder Attachment

The Porter-Cable Machine Co., 1801-8 N. Salina St., Syracuse 8, N. Y., has added to its line of abrasive belt grinders a light, narrow-belt grinder attachment designated Type N-2. This attachment is capable of performing all kinds of light burring and grinding operations. It is designed to combine the versatility of platen type grinding with the economy and speed of contact grinding, for use in performing grinding operations on flats, arcs, and angles, as well as for gear burring, weld grinding, and cleaning up operations. A wide variety of composition and plastic materials, as well as steel, iron, aluminum, wood and glass, are easily ground and surfaced with this attachment.

The attachment is especially useful in tool-rooms, sheet-metal shops, pattern shops, garages, electrical shops, assembly repair and maintenance departments, or in any type of industry where light grinding and finishing operations are required. It is

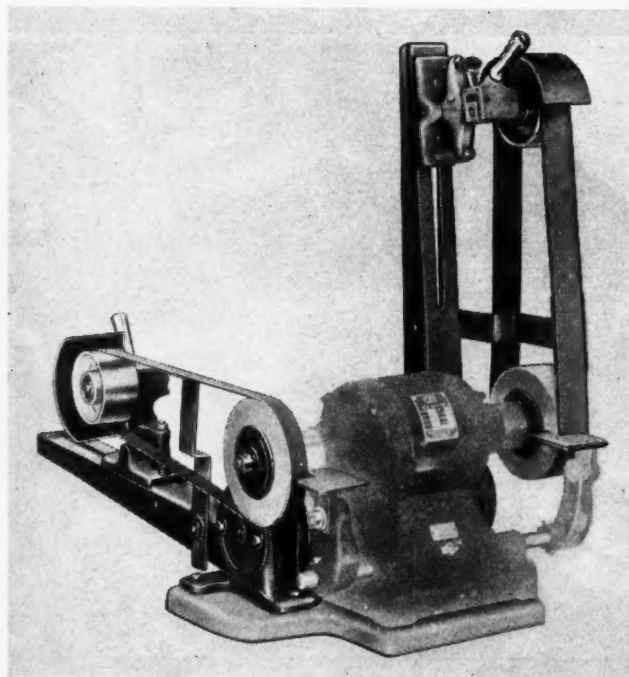
furnished without a motor and can be quickly aligned and attached to the familiar bench type wheel-grinder to which a resilient contact roll has been fitted.

The complete unit assembly is 27 inches high and 2 1/2 inches wide. The 6- by 7-inch T-shaped base is drilled with three holes for convenient mounting on a bench or work-table. The platen size for flat grinding is 2 by 4 inches. Resilient contact rolls 2 by 6 inches or 1 inch by 6 inches can be furnished. With an endless abrasive belt 2 by 48 inches, the attachment can be used either in the vertical, horizontal, or any angular position up to 90 degrees. The changing of abrasive belts can be accomplished in a few seconds. 80

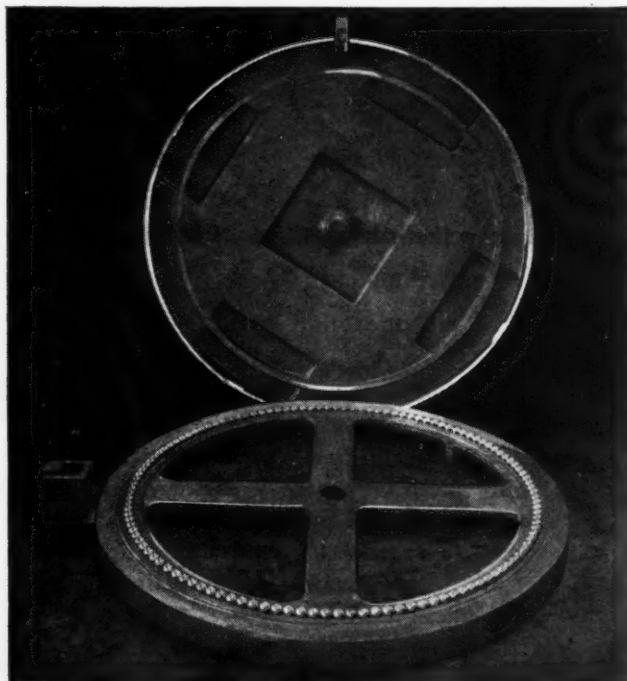
Whiting Ball-Bearing Turntables

The Whiting Corporation, Harvey, Ill., has recently introduced on the market an unusually rugged, simple turntable which carries the load on a ring of 1-inch diameter ball bearings. This allows the load to be turned or rotated to any position almost without effort.

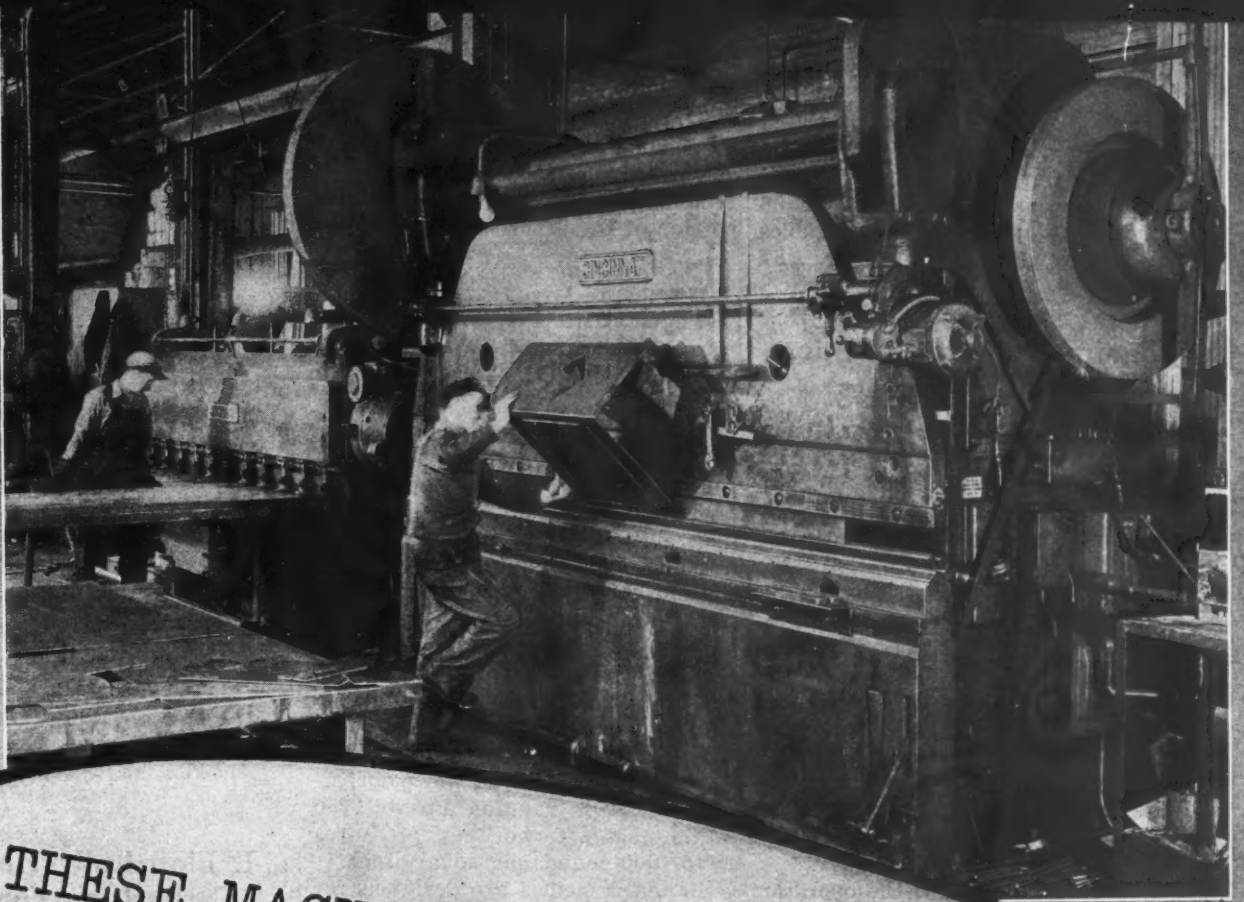
The turntable can be furnished with a plain, grooved, raised-track, or checkered top. A quick-acting, foot-operated release lock at table-top level holds the table securely in position. The top overlaps the bot-



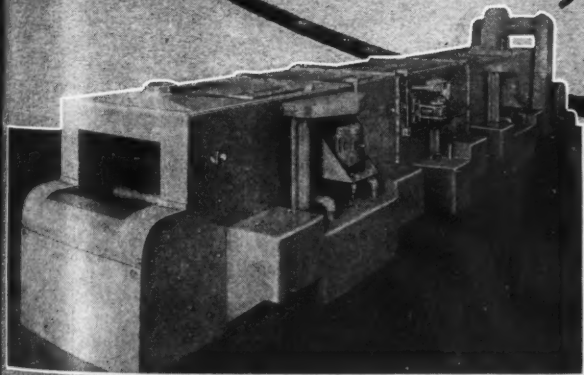
Light Abrasive Belt-grinder Attachment Made by
the Porter-Cable Machine Co.



Whiting Ball-bearing Turntable with Top Raised
to Show Simple Construction



"THESE MACHINES HAVE LITERALLY
REVOLUTIONIZED OUR MANUFACTURING
PROCESSES."



All shearing and metal forming for our Packless Pumps are performed on Cincinnati Shears and Press Brakes. These machines have literally revolutionized our manufacturing processes, in forming, finishing and streamlining our equipment. The work requires accurate performance in both shearing and forming.

—N. Ransohoff, Inc.

Write for Cat. B2, and consult our engineering department on your special metal forming and shearing problems.

- All shearing and forming on this Conveyor Type Wash, Rinse, Phosphate Coat and Dry Machine were done exclusively by Cincinnati Shears and Press Brakes.



THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS • SHEARS • BRAKES

tom casting, and thus prevents dirt from entering the bearing. Standard size tables range from 42 to 96 inches in diameter. Larger tables can, however, be built to order.81

Equipment for Broaching Holes in Forgings

The holes in two forged automobile parts are broached at each operating cycle of an Oilgear Type XP-10, 30-inch stroke vertical pull-down broaching machine recently designed by the Oilgear Co., 1312 W. Bruce St., Milwaukee 4, Wis. This broaching machine removes approximately 0.052 inch of stock in finish-broaching 1-inch holes in each forged-steel part. The forging shown in the left-hand fixture in the illustration is a front drag link bellcrank, and the forging shown in the right-hand fixture is a brake pedal. The production rate on the double set-up illustrated is 350 parts per hour.

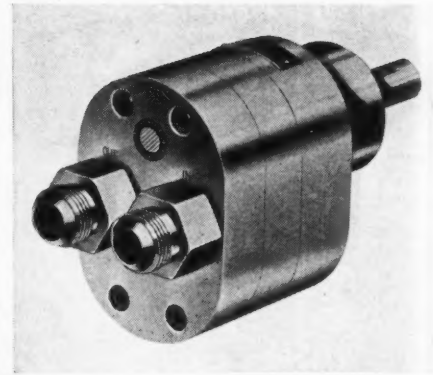
With this equipment, the operator simply loads parts roughly into the fixtures, depresses dual safety push-buttons to start the operating cycle, and removes the broached parts. Both broaches are handled automatically by the machine, and the workpieces are accurately centralized by

the shanks of the tools as they move downward. Each tool is secured at both of its ends during the major portion of the broaching stroke.82

Hydraulic High-Pressure Pump

The McIntyre Co., 200 Riverdale Ave., Newton 58, Mass., has just developed a Series 700 pump designed for high-pressure application to material-handling equipment, machine tools, oil-well sampling, power transmission, and many other types of equipment. The new direct-drive, spur-gear pump unit weighs 6 pounds, has a volumetric operating efficiency in excess of 90 per cent, and a mechanical efficiency in excess of 80 per cent. Four models cover a displacement range of from 0.4 to 9.6 gallons per minute when operating at speeds ranging up to 1750 R.P.M. against working pressures up to 1000 pounds per square inch.

Standard models are designed for direct motor application, but pumps can be furnished for flange, belt, spline, and other drives. Power requirements vary between fractional and 6 1/2 H.P. The pump body is constructed of aluminum, and the gears are of nitrided Nitalloy. Pos-

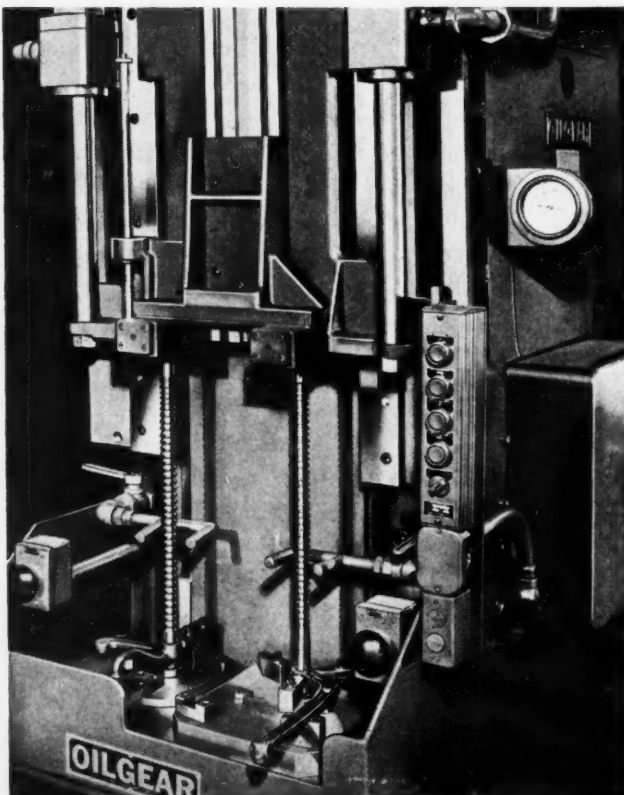


McIntyre High-pressure Hydraulic Pump

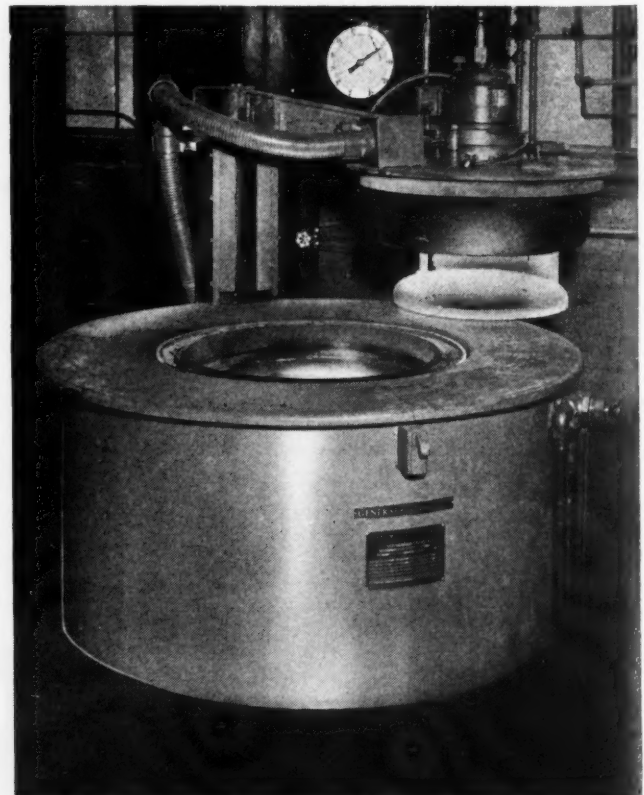
itive sealing is accomplished with linear-packing double-U cup seals. Seal chamber pressures are relieved on the suction side of the pump, so that excessive pressures are not experienced.....83

G-E Electrically Heated Gas Carburizing Furnaces

A new line of electrically heated cylindrical gas carburizing furnaces providing maximum temperatures of 1800 degrees F. has been announced by the Industrial Heating Division of the General Electric Co., Schenec-



Oilgear Machine Equipped for Broaching Holes in Two Forgings Simultaneously



Electrically Heated Cylindrical Gas Carburizing Furnace Built by General Electric Co.

Attention

HIGH- PRODUCTION INDUSTRIES



NEW SUPER SERVICE DIRECT DRIVE UPRIGHT DRILLS

21" 24" 28"

These new manufacturing type machines are of interest to automotive, electrical equipment, home appliance, farm equipment, and many other mass production industries. They are designed to produce more holes per dollar in large scale operations. Capacities, ease of controls, speed adaptability, and simplicity make them low cost producers.

See our condensed catalog in Sweet's File.



Write for Booklet U-27 for details on these machines.



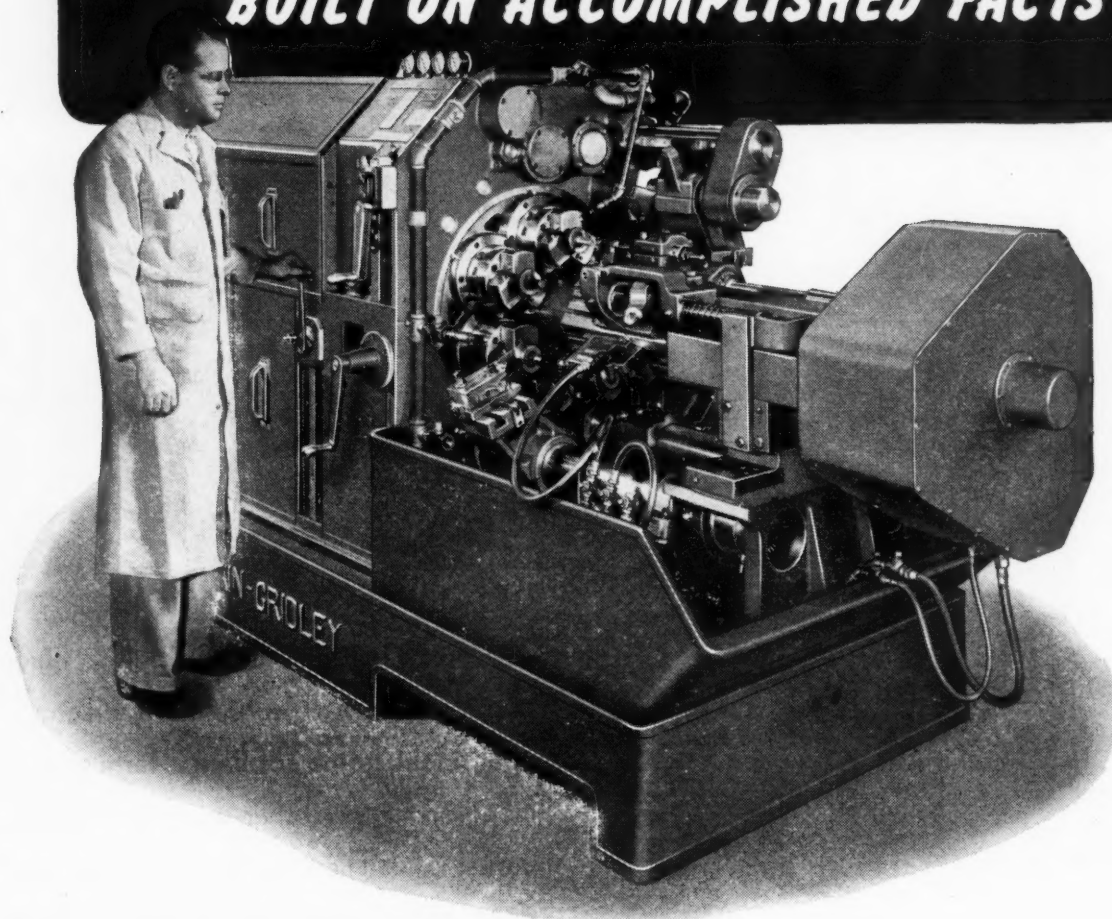
*Equal Efficiency of Every Unit
Makes the Balanced Machine*

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

MACHINERY, September, 1946—197

LEADERSHIP

BUILT ON ACCOMPLISHED FACTS



The acknowledged versatility and adaptability of New Britain Multiple Spindle Automatic Chucks is of major importance to buyers. Of equal value is the long practical experience of our engineering department in putting the capabilities of our machines to full use. The case history described on the opposite page is an interesting example of this, indicating

as it does how two high production machines were tooled for *matched* production, with consequent minimum cost per piece. Before you decide that you already enjoy top efficiency in machining any piece . . . or before you conclude that "it can't be done on an automatic", let us examine the blueprints and specifications for the job.

NEW BRITAIN AUTOMATICS

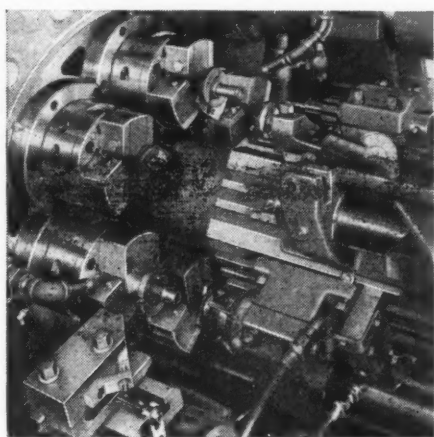
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION

...A CASE OF MATCHED PRODUCTION

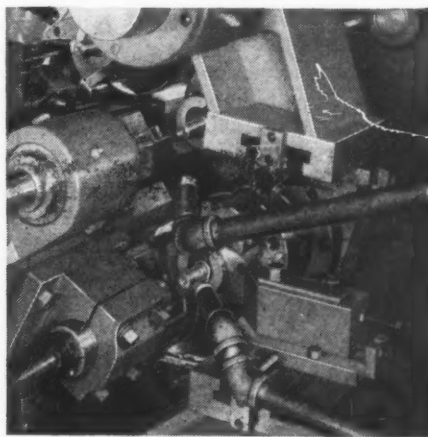


The production of the forged steel crankshaft illustrated above requires two operations. The function of the first is to finish the short eccentric

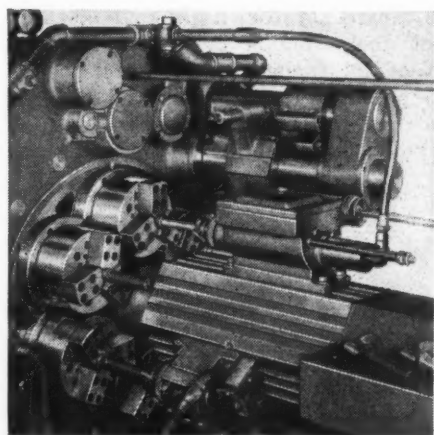
end, while the second machines the long end. Model 675 New Britain Automatic Six Spindle Chucking Machines were selected for this job and to achieve top efficiency our engineers were able to match the production of both, at 133 pieces per hour. The counterweight is faced on both sides during the first operation, enabling the second machine to operate at higher spindle speeds for the machining of the longer end.



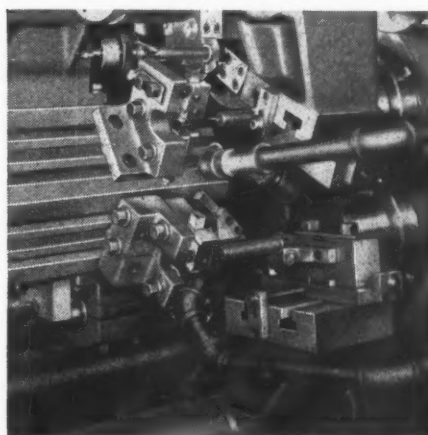
● Front view first operation . . . Entirely open end construction provides accessibility for simplified chucking, cutting tool and attachment setup.



● Rear view first operation . . . Wide open end construction provides extra large chip space . . . accessibility from three sides and from above that permits excellent visibility and easy tool adjustment.



● Front view second operation . . . Note accessibility to tools through entirely open end construction.



● Rear view second operation . . . Note relationship of cross arms to tool slide permitting more efficient tool layout and high production.

New Britain builds a complete line of Multiple Spindle Automatic Chucking Machines . . . four, six and eight spindles up to 12" capacity . . . Also a complete line of Multiple Spindle Automatic Screw Machines to 2 1/4" capacity.

tady, N. Y. These gas furnaces are intended for use in carburizing such parts as gears, splines, pins, and bearing races. Rapid and uniform distribution of carburizing gas throughout the furnace charge by a fan located on the furnace cover is a feature of the new furnaces.

The new line includes three furnaces rated at 59.5, 77.5, and 110 K.W. Loading baskets in the three sizes are 20 inches in diameter by 24 inches deep, 20 by 36 inches, and 25 by 36 inches. The furnace cover is lifted hydraulically, and guides are provided which prevent it from being lowered unless it is in the proper position for sealing with the retort in the furnace. Each furnace is equipped with a 1 1/2-H.P. fan. Tanked propane or natural gas is used as the carburizing medium. The gas flow is regulated by a needle valve, and there is a visual flow meter on the operator's control panel. The panel also contains an automatic temperature-control instrument and a strip type chart temperature-recording instrument for the circulating atmosphere and the charge of steel.84

Zagar Keyway Broaches

Standard keyway broaches in sizes for broaching from 1/8-inch up to 1/2-inch keyways have been developed by Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio. Adapters are available which enable these broaches to be used for broaching keyways in holes from 1/2 inch up to 1 1/4 inches in diameter. These broaches fit the 20-inch Zagar horizontal broaching machine.85



Di-Acro Bending Brake Made by O'Neil-Irwin Mfg. Co.

Di-Acro Brake of Increased Capacity

A 24-inch Di-Acro brake, known as the No. 4, has just been added to the line of bending brakes made by the O'Neil-Irwin Mfg. Co., 333 Eighth Ave. South, Minneapolis, Minn. New features incorporated in this brake include special material clamping action, which makes possible extremely sharp bends; double-edge vertical folding plate, which allows close reverse bends to be formed; Torrington roller bearings, which greatly increase speed and ease of operation; quickly adjustable material gage, which assures precision in all duplicated parts; and precision angular degree stops.

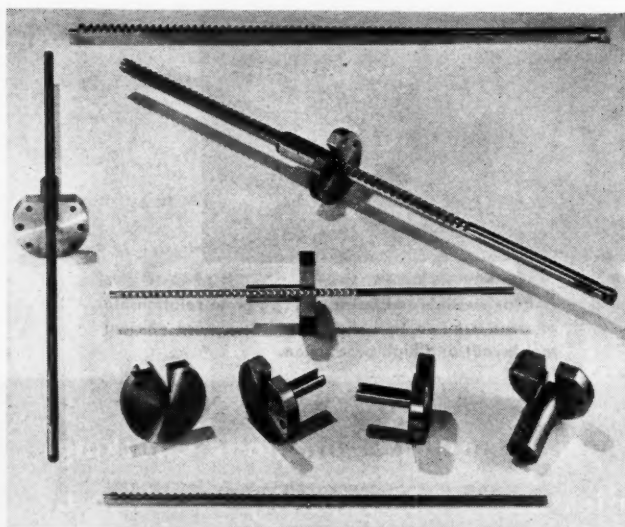
The new brake has a capacity for handling 16-gage sheet steel, a maximum forming width of 24 inches, and a weight of 285 pounds. It is adapted for operations on ductile

metals such as copper, bronze, stainless steel, aluminum, sensitized materials, and varnished cambrics and dielectrics. Shapes and outlines are formed with this brake which are often impractical or impossible to duplicate with regular production dies. Many small parts normally produced by large hand- or power-operated brakes can also be rapidly and accurately formed on the new machine.86

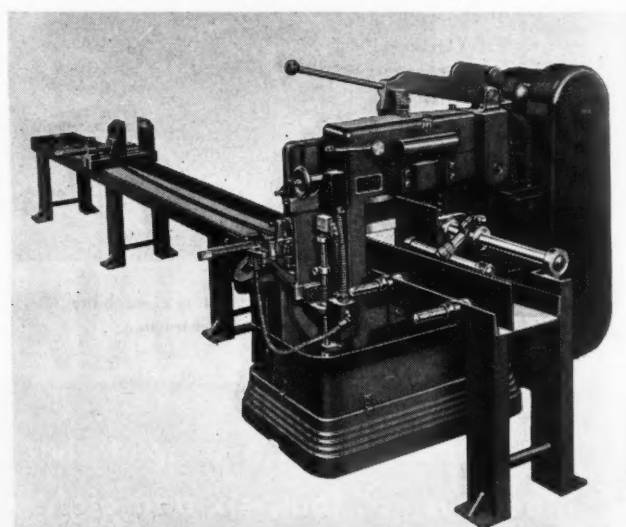
Metal-Sawing Machine with Automatic Bar Feed

The Peerless Machine Co., Racine, Wis., has brought out an electrically controlled, bar-feed conveyor for the company's "Mechani-Cut" saw, which makes the sawing of bar stock, pipe, tubing, or heavy billets a fully automatic operation. The automatic pull-up or feeding device and the automatic gaging arrangement can be adjusted for cutting the work into any length from 1/8 inch to 48 inches. When a cut is completed, the multiple bar-clamping device releases the work, which is then advanced a predetermined length by the conveyor feed, re-clamped and cut off, the complete cycle of operations being performed automatically.

In case of saw blade breakage or accident, a micro-switch-operated safety device automatically stops the machine. When the last stub or piece of bar stock, billet or tube remaining on the conveyor contacts the limit switch, the machine operating cycle is automatically stopped. The conveyor is being built for 7- by 7-inch and 11- by 11-inch "Mechani-Cut" saws.87

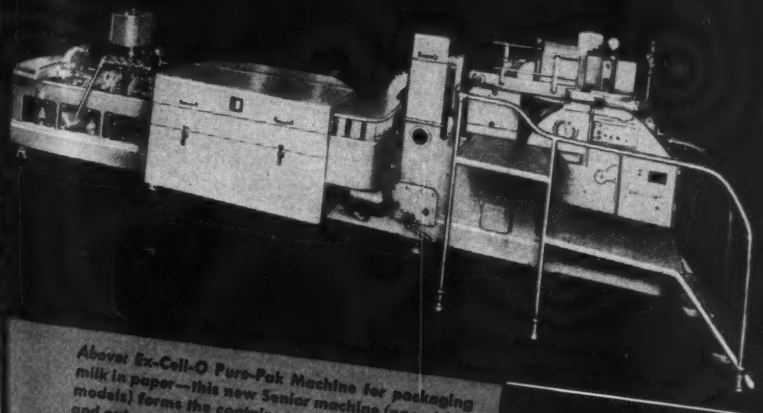


Keyway Broaches and Adapters Developed by Zagar Tool, Inc.



Peerless Automatic Bar Feed for Metal-sawing Machine

DIVERSIFIED ?



Above: Ex-Cell-O Pure-Pak Machine for packaging milk in paper—this new Senior machine (one of five models) forms the containers, sterilizes them inside and out, cools them, fills, seals and dates them—all in one continuous, automatic operation in the dairy. Pure-Pak containers for dairy products are now being used at the rate of more than one billion containers a year.

To Right: Ex-Cell-O engineering services and precision machines are being used by many American industries for the mass production of accurately-made parts and sub-assemblies. Shown is Ex-Cell-O special machine for broaching and reaming 18 holes and drilling 36 holes in a magnesium crankcase.

XLO

EX-CELL-O for PRECISION

... the pioneering spirit of Ex-Cell-O remains undaunted!

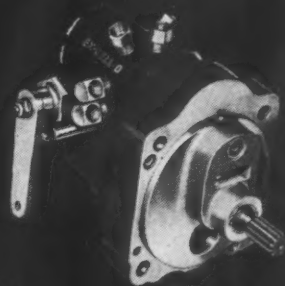
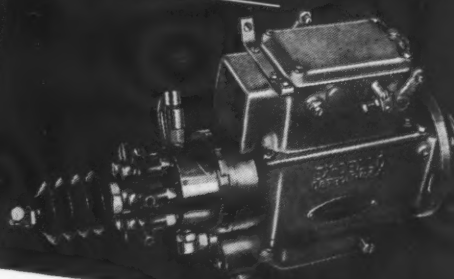
... an opportunity to reaffirm our company's allegiance to the pioneering spirit that brought it into existence. It is a spirit that maintained Ex-Cell-O unfailingly during the economic extremes of the twenties and the thirties, and that enabled the company, during the early forties, to make a worthwhile contribution to our nation's war effort. I can say in all sincerity that the same spirit impels the whole Ex-Cell-O organization of today ... a clear assurance of the active role that Ex-Cell-O will play in the peacetime years immediately ahead.*

**from a message by Phil Huber, President and General Manager of Ex-Cell-O Corporation, on the occasion of the company's 25th Anniversary ... as timely and significant now as when given in 1944.*



Above: Ex-Cell-O Fuel Injection Pumps—for high speed DIESEL engines in the automotive, marine and industrial fields.

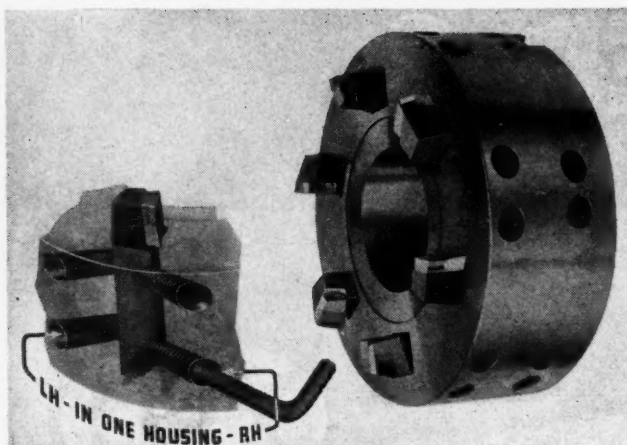
To Right: Ex-Cell-O GASOLINE Injection System for aircraft engines—the advantages of gasoline injection make flying safer, easier, and more economical and enjoyable.



EX-CELL-O

CORPORATION • DETROIT

Manufacturers of Pure-Pak Paper Milk Bottle Machines, Aircraft and Miscellaneous Production Parts, Precision Machine Tools and Equipment, Continental Cutting Tools, Fuel Injection Equipment, Railroad Detail, and Drill Jig Bushings.



Lovejoy Face-milling Cutter Designed to Take Left- or Right-hand Blades

Lovejoy "Cutsall" Face-Milling Cutter

The Lovejoy Tool Co., Inc., Springfield, Vt., has developed a new tool-bit type face-milling cutter known as the "Cutsall." This cutter embodies several novel design features. The housing is built to take either left- or right-hand blades. It holds the blade face slightly back of the center, so that positive and negative radial rake can be obtained from the same blades. There are two set-screws for each blade; one bears on the tapered base of the blade, as indicated in the accompanying phantom view, and provides for fine blade adjustment, while the other locks the blade in the housing. The blades have extra large Carboloy cemented-carbide tips, and can be sharpened on an off-hand, adjustable-table, single-point tool grinder, exactly the same as regular lathe tools.

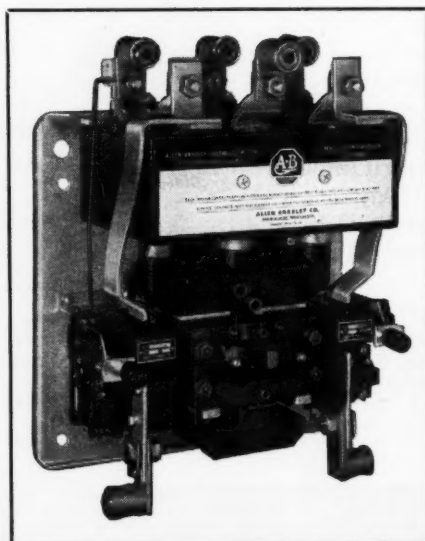
The construction of the "Cutsall" is rugged and balanced to make heavy cuts in tough stock at high spindle speeds. It is available in 6-, 8-, 10-, and 12-inch diameter sizes. One size of Carboloy-tipped blade will fit all four cutter sizes. The blades are tipped with either of two grades of Carboloy cemented carbide—one for steel and the other for cast iron and non-ferrous metals.88

Michigan Cone-Drive Speed Reducers

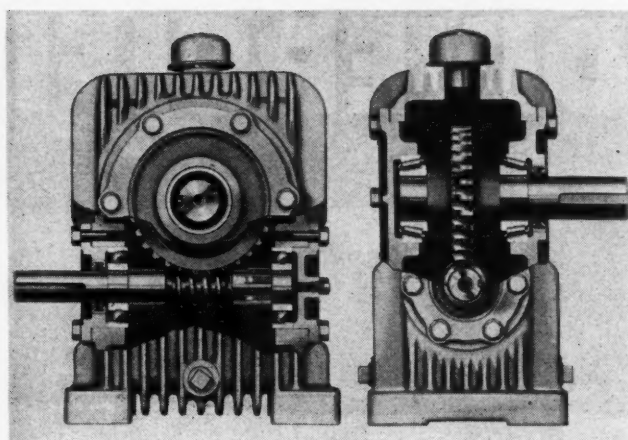
A complete standardized line of compact speed reducers, built around double enveloping cone-drive gearing, has been announced by the Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. These units, in various models from frac-

tional-horsepower sizes up to sizes capable of transmitting 800 H.P., are made to suit a wide range of applications. The high load-carrying capacities of these speed reducers in proportion to their size is said to be due to the large number of teeth in driving contact and the large contact area per tooth of the cone-drive type of gearing. This characteristic makes it possible to use smaller gears to transmit a given load which, in turn, results in more compact housings.

The new standardized line includes models with "over" and "under" pinions and with vertical gear-shafts. The center-distance range of from 2 to 18 inches is said to cover a power-transmission range equivalent to from 3 to 24 inches for worm-gear drives of corresponding capacities. Either right- or left-hand assemblies are available, with ratios ranging from 5 to 1 up to 70 to 1.



Allen-Bradley Solenoid-operated Motor Starter



Michigan Cone-drive Speed Reducer with Casing Cut away to Show Gearing

Extended pinion- and gear-shaft models are also available. All parts for any model of a given size are interchangeable. Cooling fins are provided to step up the thermal capacities and thus assure longer life from the gear set and bearings. The fins also serve to increase the rigidity and strength of the housings. All 4- to 18-inch center-distance drives can be equipped with water-cooling coils to provide increased thermal capacity when required.89

Allen-Bradley Solenoid Starter

To meet the demand for a larger starter of the solenoid switch type, the Allen-Bradley Co., 1311 S. First St., Milwaukee, Wis., has developed the Size 5, Bulletin 709 model shown in the accompanying illustration. This new unit, which has a maximum rating of 100 H.P. 220 volts, and 200 H.P. 440, 550, and 600 volts, will replace the older Bulletin 710, Size 5 clapper type starter.

The double-break cadmium silver contacts are totally enclosed in an arc hood, each pole of the switch having its individual chamber, so that the starters can be closely grouped without danger of flash-over between switches.

The starter is mounted on a self-insulated metal baseplate which can be mounted on any metal surface without additional insulation. It can be provided with or without an enclosure. The enclosed starter is available in the NEMA Type 1 sheet-metal enclosure model for general-purpose applications, the NEMA Type 4 water-tight and weatherproof design, and the NEMA Type 5 for operation under non-hazardous dust conditions. 90



Get these
BIG ADVANTAGES with
Standard **CARBOLOY** Blanks
(TRADEMARK) CEMENTED CARBIDE
... at amazingly low cost!

... into production **FAST!**

... adaptable to most jobs!

... priced as low as 9c each!

Here's how to get those rush jobs into production fast! Keep a supply of Standard Carboly Cemented Carbide Blanks on hand—select the ones you need—brazing them to your shanks—quickly grind—and you're ready to go!

And with all this extra convenience, you actually save plenty, because these Standard

Standard Carboly Cemented Carbide Blanks can be used "as is" on many jobs, or ground to special shapes for your individual requirements.

Carboly Cemented Carbide Blanks are priced low—some of them as low as 9c each!

Speed your production—give faster service—reduce job costs by keeping your tool room stocked at all times with Standard Carboly Cemented Carbide Blanks. Check your supply now. (For more details, write for free catalog GT-175R.)

CARBOLOY COMPANY, INC.

11147 E. 8 MILE BLVD.

• DETROIT 32, MICHIGAN

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**Stock up
NOW on**

Standard **CARBOLOY** *Blanks*
(TRADEMARK) CEMENTED CARBIDE

Also Sold by Leading Mill Supply Distributors



"Opti-Check" for Measuring Rake and Clearance Angles of Tools

"Opti-Check" for Checking Cutting Tools

The Benton Co., 351 S. LaBrea Ave., Los Angeles 36, Calif., has designed a simplified optical tool, known as the "Opti-Check," which will quickly and accurately measure rake and clearance angles on all types of cutting tools. It is also useful for many other precision measuring applications. Angular measurements on cutting tools are taken by holding the tool in contact with a straightedge mounted on the Opti-Check base and aligning precision guide lines with the cutting edge in an optical viewer. Readings are then taken directly from a protractor scale. Both the image of the tool and the protractor are viewed through magnifying lenses. When measuring angles difficult to check by conventional means on large work-pieces, the Opti-Check can be used in conjunction with a surface plate.

The optical unit consists of a reticule mounted in a short aluminum barrel upon which cross-lines are scribed. The reticule and tool under inspection are viewed through a magnifying lens from a normal reading distance.

This instrument has many uses, including verifying the correct cutting angles, exact clearance angles, and uniformity of length of cutting lips on all tools up to 1 inch in diameter, and can be used for checking drills, reamers, counterbores, milling cutters, forming tools, lathe tools, etc. Angular readings can be taken to an accuracy of 15 minutes of arc. Duplication of cutting and clearance angles for a particular job is easily

accomplished, and tools can be inspected on the grinder for accuracy or on the machine for wear.91

Spitfire Flat Lapping Machine

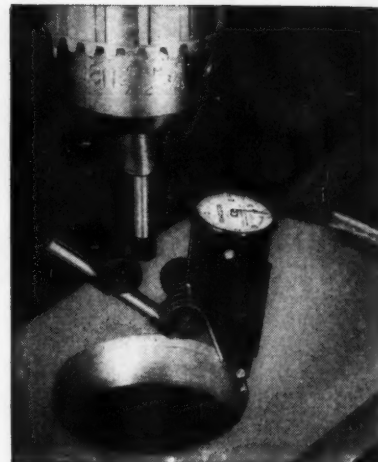
A new low-cost machine designed for the high-speed precision flat lapping of single parts or for production runs on hardened steel, quartz, and glass work has been placed on the market by Spitfire Tools, Inc., 2933 N. Pulaski Road, Chicago 41, Ill. With this machine, it is possible to obtain a surface finish as fine as 2 r.m.s. micro-inches. Single pieces ordinarily require no holders, the operator merely laying the piece on the revolving circular lapping plate and directing its motion with his hands. Production lapping of large quantities of small parts can be accomplished by the use of standard or special holders designed to suit the particular requirements.

The machine has many uses, among which are the precision flat lapping of machine and tool parts, flat sliding surfaces, flat rotating surfaces, air-tight and liquid-tight seals, and flat surfaces on plastic molds, die-casting molds and drawing dies.

All gears and bearings in this machine are factory sealed, with sufficient lubricant to serve for the life of the machine. The lapping plate revolves on a number of precision sealed ball bearings.92



Flat Lapping Machine Brought out by Spitfire Tools, Inc.



Federal Vertical Type Indicator Locating Work on Jig Borer

Federal Perpendicular Type Universal "Testmaster" Dial Indicator

A new type of "Testmaster" universal indicator, constructed with the dial perpendicular to the axis of the body of the instrument, has been put on the market by the Federal Products Corporation, 1144 Eddy St., Providence, R. I. The perpendicular location of the dial makes this type of Testmaster particularly useful for general machine shop, tool-room, and inspection work. It is especially adapted for jig borers, and also for certain drill press and milling machine applications. Dovetails, friction clamps, and rods facilitate setting the indicator for checking a wide range of hole sizes with the dial in the horizontal position.

The Models 5 and 6 indicators have graduations of 0.001 and 0.0001 inch, respectively. The Models 7 and 8 have metric system graduations of 0.0025 and 0.01 millimeter, respectively. Like the regular Federal Testmaster, the new perpendicular model has a simple, direct combination of lever and crown gear movement and jeweled bearings. These indicators are supplied in plastic cases, with dovetail clamp and tool-post holding bar.93

General-Purpose Industrial Photo-Electric Control

Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass., has brought out two new general-purpose photo-electric controls designated Series 20 and 21, which are adapted for a wide variety of industrial applications. These controls are rugged, high-



Just a **TAP** of the finger!

• That's all it takes to obtain any one of 12 spindle speeds on a Gisholt Turret Lathe . . . instantly . . . without releasing the main drive clutch . . . without even stopping the spindle. With the Gisholt Hydraulic Speed Selector you eliminate all manual gear shifting—put an end to needless effort and waste time between cuts.

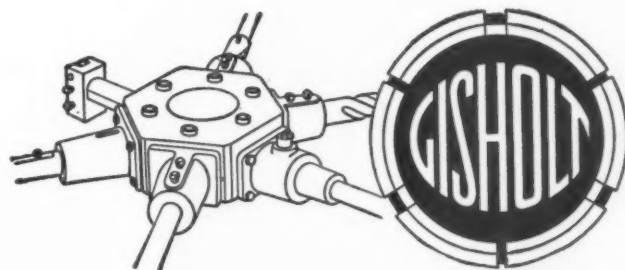
It is particularly effective where parts require turning a number of diameters. You set up the job, determine the ideal machining speed for each cut, and pre-set the speed selector with reference to the diameter of the work. Then you have merely to touch the trip for each successive speed change. There's no effort to it. The speed selector is power-operated.

Or, you can use the speed selector "direct"—by simply turning the control wheel to obtain any desired spindle speed without intermediate stops.

However you use it, it saves time, speeds up production, cuts machining costs. Write for literature.

GISHOLT MACHINE COMPANY

1209 East Washington Avenue • Madison 3, Wisconsin



Look Ahead . . . Keep Ahead . . . with Gisholt

speed units designed for such applications as counting, conveyor control, short-range signal systems, motor or valve control, production inspection, machinery safeguards, stop-motion control in the paper and wire industries, as well as automatic control for hundreds of specialized processes.

The photo-tube, which must be located at the point where operations are being observed, is either made integral with the housing or supplied in a small separate housing to permit its use where space is limited. The control is impervious to moisture, and is designed to give unlimited life under conditions of extremely high temperature and humidity. It is said to be vibration-proof.94

DoAll All-Purpose Grinding Wheel

The DoAll Co., 1301 Washington Ave., S., Minneapolis 4, Minn., has announced a new all-purpose grinding wheel. This wheel is made for grinding any kind of material, including hardened alloy tool steel, annealed steel, stainless steel, Monel, bronze, aluminum, brass, and hard plastics. It is said to operate equally well on heavy, high-speed roughing cuts and fine finishing work. The new wheel is said to produce a precision finish comparable to that of a 300-grit wheel. It can be used on all types of grinding machines. No alteration of the machine is necessary when using this wheel.



All-purpose Grinding Wheels
Made by the DoAll Co.

The bond used in making these wheels is insoluble, and thus prevents them from weakening when coolants are used for wet grinding operations. The open structure of the wheel is such, however, that the work remains cool even when dry grinding. These all-purpose grinding wheels are available in types No. 1 (straight), No. 5 (recessed on one side) and No. 7 (recessed on two sides). Sizes range from 1 to 14 inches in diameter by 1/4 to 3 inches in thickness. They can be furnished with any size arbor hole.95



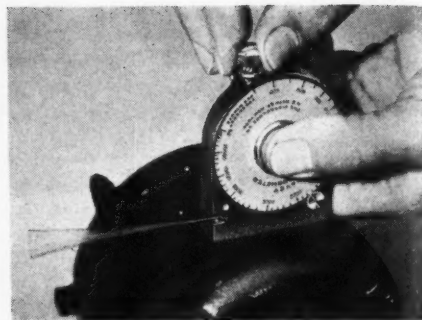
Fly Cutter Placed on the
Market by Wendt-Sonis Co.

Wendt-Sonis Fly Cutter

A universal fly cutter designed for all kinds of ordinary and step milling operations on all types of materials has just been introduced to the trade by the Wendt-Sonis Co., Hannibal, Mo. The inserted blades of this cutter are easily interchangeable in the cutter body, and can be readily removed for sharpening on an ordinary bench grinder.96

Davey Vibroscope

A vest-pocket size Davey "Reed Vibrometer" weighing only 5 ounces, which will measure machine vibrations of 450 to 50,000 cycles per minute, and which can be used to compare vibration amplitudes, has been brought out by the Vibroscope Co., 6 E. 39th St., New York 16, N. Y. This device has a vibrating reed which can be fed out from the body of the instrument to tune it to the machine vibrations. When extended the exact length to be in tune with the vibrating machine, the reed suddenly "snaps" into sharp vibration. The amplitude of the reed vibrations is proportional to the amplitude of the machine vibrations, being 1/2 inch for a machine vibration of 0.001

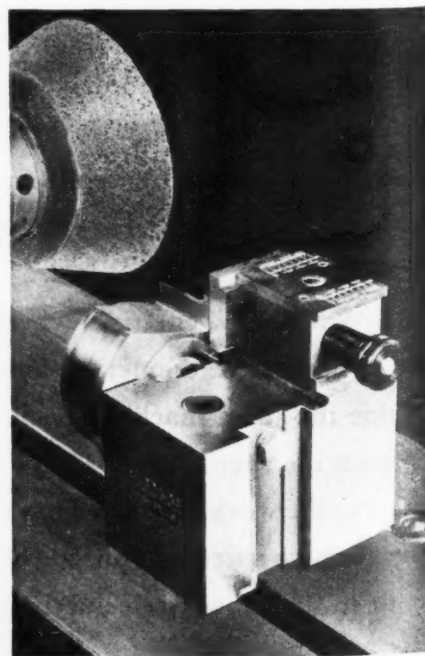


Davey Reed Vibrometer

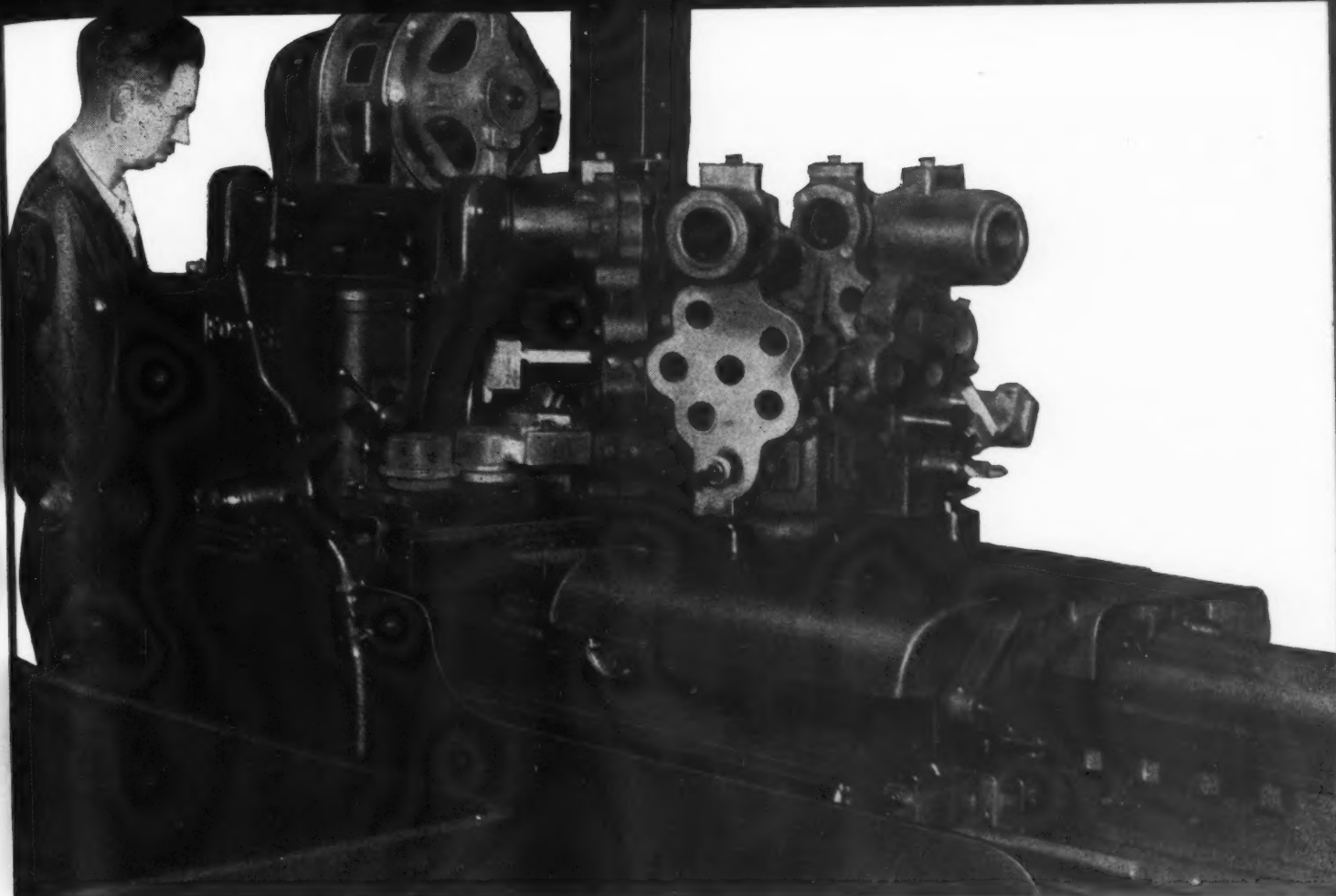
inch. The vibrating frequency of the machine, in cycles per minute, is indicated directly on the graduated dial. Since the musical note produced by plucking the reed corresponds with the frequency reading on the instrument, it is possible to make use of this characteristic for determining the frequency of noise emanating from a machine when conducting a noise analysis.97

Hardinge Sharpening and Checking Fixture for Circular Form Tools

A combination fixture designed to provide a convenient and accurate means for rapidly sharpening and checking the sharpening of circular form tools for automatic screw machines and turret lathes has been brought out by Hardinge Brothers, Inc., Elmira, N. Y. This fixture can be easily applied to the table of any



Hardinge Sharpening and Checking
Fixture for Circular Form Tools



2-Step Sheaves—in *8½* Minutes with the **FASTERMATIC**

Here's a perfect example of the Fastermatic's ability to handle a large number of cutting operations in one chucking—and *fast!*

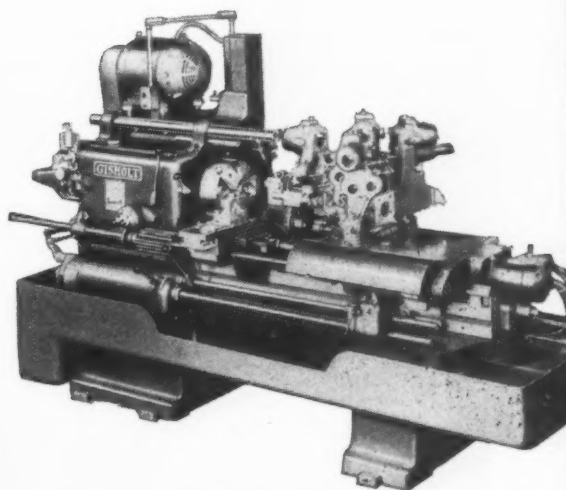
The machining of these 2-step sheaves calls for 16 different cuts. To obtain the most efficient rate for each work diameter, the machine automatically changes speeds and feeds 8 times as the turret indexes through its 6 positions. And it's *all* automatic; the operator has only to load, start the machine, and remove the finished work. Floor to floor time is 8 minutes, 30 seconds.

Naturally, production like this means rock bottom costs. Moreover, the flexibility of the Fastermatic makes it possible to handle a wide variety of work with easy setup and simple tooling. Write for literature.

GISHOLT MACHINE COMPANY

1209 E. Washington Ave. • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . with Gisholt



The Fastermatics are universal automatic turret lathes, equipped with a hydraulic feed system automatically controlled by standard feed cams. Cross slides are individually controlled and can be engaged for simultaneous operation with turret tools. Literature on request.

standard tool grinder. It can be used for sharpening circular form tools for either right- or left-hand cutting which have plain, octagon, serrated, ratchet or pin type hubs. Tools can be sharpened and the sharpening checked without removing them from the fixture or tool grinder.

The fixture is applied to the tool-grinder table and the tool is located on the fixture in the proper position for sharpening by the sliding gage-bar, which is set according to graduations on the top of the fixture. A cup style grinding wheel is used for sharpening the tool.

Circular form tools within the following sizes can be sharpened on this fixture: Smallest center hole in tool, 1/4 inch; largest center hole, 1 inch; maximum tool diameter, 3 1/2 inches; maximum length, 2 1/4 inches; and maximum amount below center for cutting edge of tool, 13/16 inch.....98

"Tensiometer" for Maintaining Correct Tension on Power Hacksaw Blades

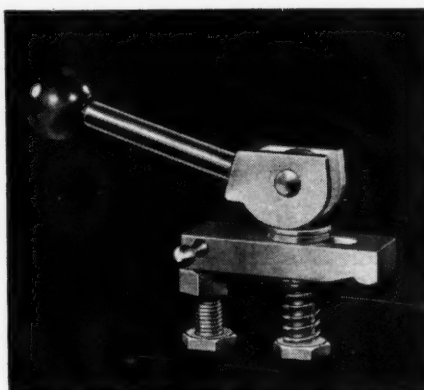
The Millers Falls Co., Greenfield, Mass., has recently developed a "Tensiometer," designed to maintain the correct blade tension on power hacksaws. This device consists essentially of a small cylinder enclosing a strong calibrated spiral spring. It can be easily attached to the blade-holder of the machine, and acts as a shock absorber for the blade, automatically compensating for changes in feeding pressure, thermal expansion and contraction, and the shocks to which power hacksaw blades are usually subjected. With this arrangement, the hacksaw blade can be operated under any tension from 0 to 4000 pounds, the machine operator being able to readily set the tension at any desired figure by means of the calibrated indicator. It is claimed that,

with this control, the accuracy of the cut is improved and the cutting life of the saw blade is increased.....99

Improved Fixture Clamps

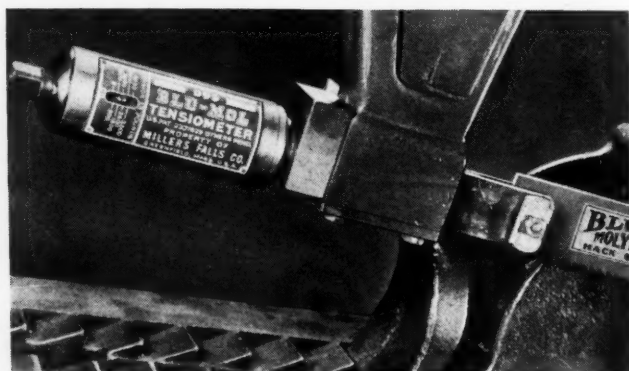
A series of five "Wespo" fixture clamps for holding work-pieces is being made by the West Point Mfg. Co., Farmington, Mich. The clamps in this new series have ground stud washers with ground spherical radii, which allow the clamp to float and thus compensate for irregularities in the work. The clamp handle is provided with a plastic, ball-shaped knob to facilitate operation.

These clamps are made of heat-treated alloy steel, and are cadmium-



Fixture Clamp Made by the West Point Mfg. Co.

plated. They are supplied in five different types, arranged for different clamping methods. Each type is made in six sizes, all of which are adjustable for height. Exact-scale templet drawings of each type and size of clamp are available, so that tool designers can include the required clamps in their fixture design drawings. 100



"Tensiometer" for Power Hacksaw Blades, Developed by the Millers Falls Co.

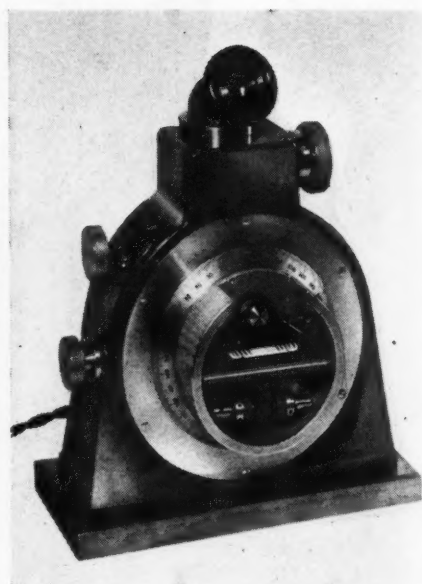


Fig. 1. "Microptic" Precision Clinometer Made by the Engis Equipment Co.

Instruments for Checking Angles and Inclined Surfaces

The Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill., is introducing a new type of precision clinometer called the "Microptic," which is shown in Fig. 1. This instrument will check angles optically over a full 360-degree circle to graduations of 0.05 minute of arc. It consists of a light alloy body containing an accurately divided glass circle and optical scale-reading system. The under side of the instrument has a hard steel base with a lapped surface.

Another instrument brought out by this company, designated the Clinometer Model C, is especially designed for use in the aircraft-building industry. This instrument, shown in Fig. 2, can be used to quickly check angular pitches of

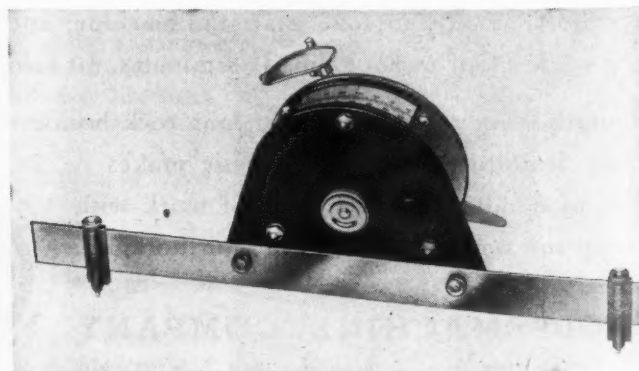


Fig. 2. Engis Clinometer Developed for Use in the Aircraft Industry

For those tough railroad jobs



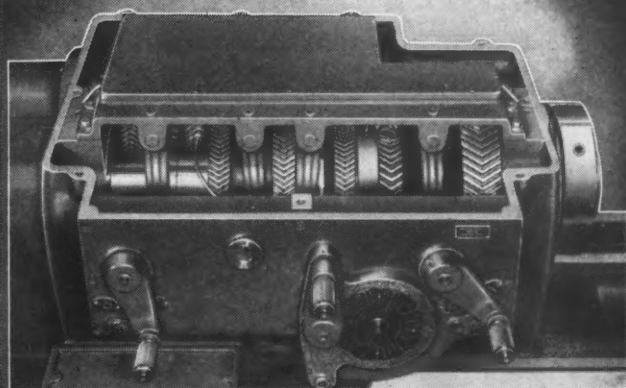
Sidney Lathes

CONTINUOUS TOOTH *Herringbone* **GEARED HEAD**

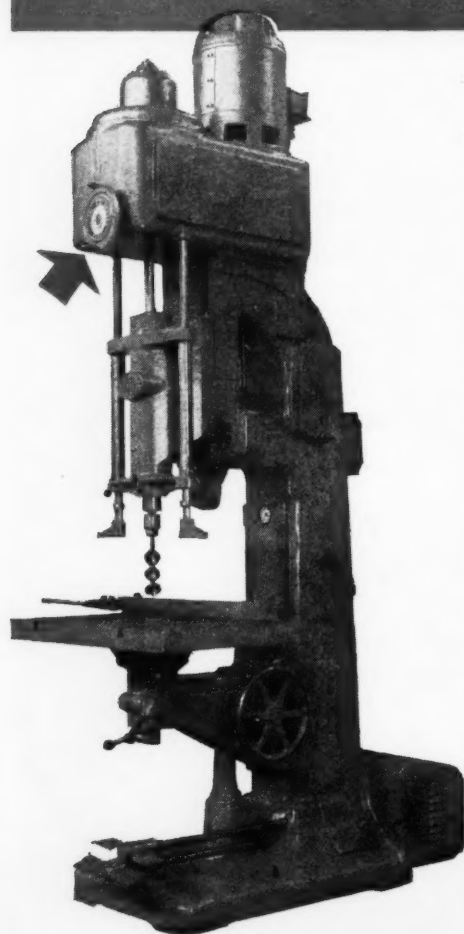
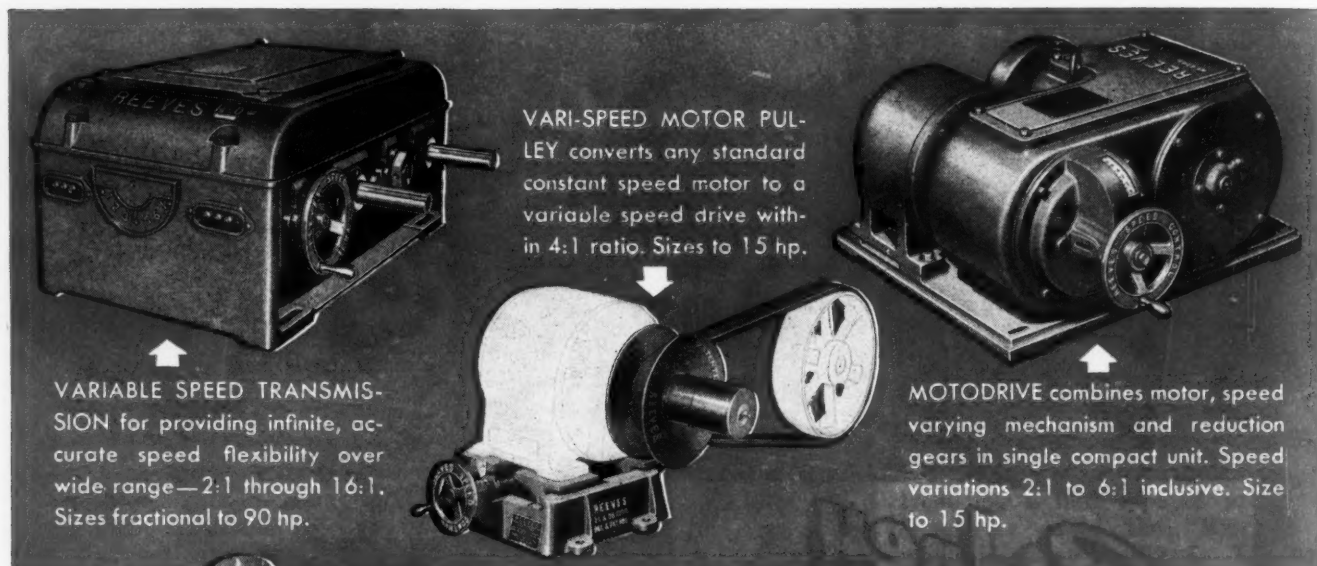
● A typical railway axle turning job being handled on a 25"x12' Sidney Lathe. The Sidney exclusive Herringbone headstock provides ample power for heavy roughing cuts employing the use of carboloy tipped tools and for exceptionally smooth, accurate finishing operations.

Sixteen speeds available through sliding clutches on multiple splined shafts—gears constantly in mesh—spindle and intermediate shaft mounted on anti-friction bearings assure maximum power to spindle and a wide range of operating speeds.

BULLETINS AVAILABLE



Modern Reeves Speed Control for Modern Machines



● REEVES Speed Control—without stoppage or slow-down—provides instant and accurate adjustment of machine speed to the requirements of the job at hand and to the skill of the operator involved. It widens the machine's work range, permits it to do more different jobs and more work with greatest accuracy, uniformity and efficiency. In short, modern REEVES Speed Control is the mark of modern, productive, profitable machines throughout Industry.

REEVES units, manufactured in a wide range of sizes, designs, speed ratios and furnished with all types of controls, are easy for the mechanic to maintain and service without special tools or training. Now standard equipment on 2,100 different makes of machines, REEVES Speed Control is also easily applied to machines in service. So, in buying new machines, or in modernizing old ones, make sure of modern performance by specifying modern REEVES Speed Control. A nation-wide staff of experienced engineers is available for consultation... for complete information write for catalog M-450.

Arrow in photo at left indicates position of the REEVES Motodrive (internal operating parts only) which is furnished as standard equipment on this Single Spindle Borer, manufactured by the B. M. Root Company, York, Pa. An unusual feature of this machine is the fact that the spindle moves vertically in a splined bushing fitted into variable disc of the REEVES unit, providing instant, infinite speed adjustability.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

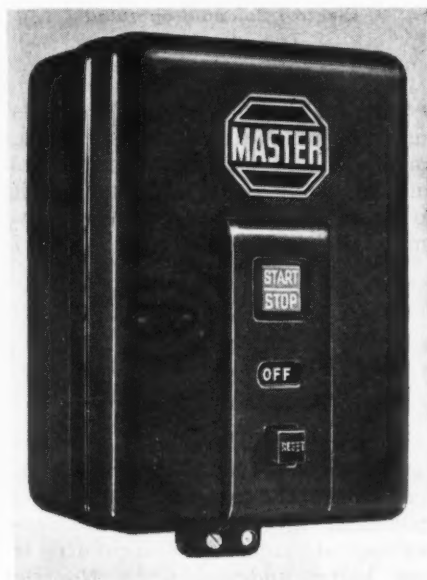
Recognized Leader in the Specialized Field of Speed Control Engineering

Accurate Variable
REEVES Speed Control
Give the Right Speed for Every Job!

propellers and plane surfaces on fuselages, wings, and other members to an accuracy of 1 minute. The straightedge member of this device is removable, and can be replaced by templets made to fit the work.101

Across-the-Line Magnetic Starter

The Master Electric Co., 126 Davis Ave., Dayton 2, Ohio, has developed an alternating-current, across-the-



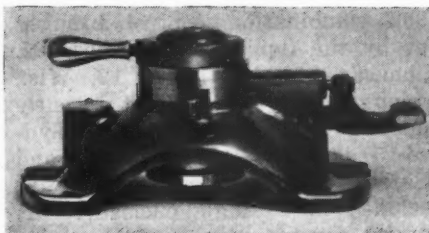
Magnetic Motor Starter with Single-button Control

line magnetic motor starter with a single push-button for starting and stopping. This feature has been developed to give a quicker and surer control over the motor. A visual mechanical signal is provided to indicate whether the motor starter is in the "off" or the "on" position. The single button control, together with its signal flag, is available either as an integral part of the starter or as a remote control.

Standard voltage ratings are 115 and 230 (dual voltage) for single-phase, and 110, 208, 220, 440, and 550 for polyphase motors. Starter ratings are 60, 50, and 25 cycles.....102

G & H Collet Indexing Fixture

The G & H Mfg. Co., 327 Elm St., Fitchburg, Mass., has brought out a collet indexing fixture designed to hold work for milling, grinding, and shaper operations. This fixture can be mounted either horizontally or



G & H Collet Indexing Fixture

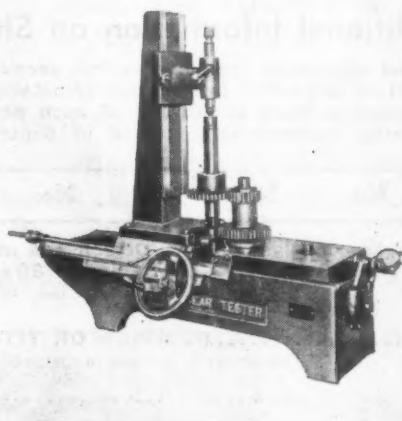
vertically on the machine table. It is designed to prevent movement of the work once it is gripped in the collet, and to prevent it from changing position when closing the collet.

Removable screw-insert stop-buttions are used to block out indexing stations not required when a set-up is being made. A chip clearance hole extending entirely through the fixture provides ready exit for chips.

Collets such as are commonly used in Brown & Sharpe automatics and wire-feed screw machines are often specified for use in the G & H indexing fixture, but other types of draw-in and push-out collets can be used, provided the fixture is equipped with the correct closing piece.103

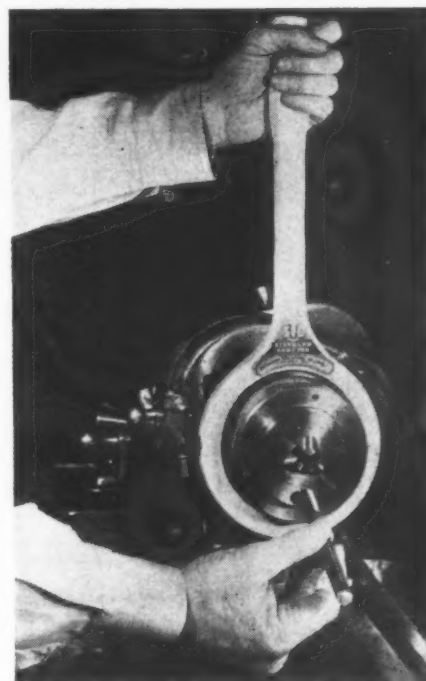
Parkson Gear Testers

The George Scherr Co., 199 Lafayette St., New York 12, N. Y., has added two new model Parkson gear testers to its line of gear-testing machines. The new testers have a maximum capacity of 15 inches between centers. One is equipped with a box-shaped upright which carries an adjustable bracket with means for clamping it in any position. This arrangement provides vertical centers for holding gears or pinions that are cut integral with their shafts or are mounted on arbors.



Parkson Gear Tester with Vertical Centers

The other model is designed for testing internal gears, either directly against the mating pinion or against a master. When external gears are tested, the measuring pressure in the floating slide which makes contact with the dial gage is positioned toward the mating gear. When internal gears are tested, the pressure must be in the opposite direction. To provide for this, the internal model has an ingenious but simple arrangement which permits the direction of the pressure to be reversed at will. Thus, internal as well as external gears can be inspected for center distance, run-out, tooth thickness, and rolling action. Both models have a precision scale and over-size vernier for setting to the correct center distance. A recording attachment is available as optional equipment...104



Hampton High-speed Chuck

Hampton Speed Chuck

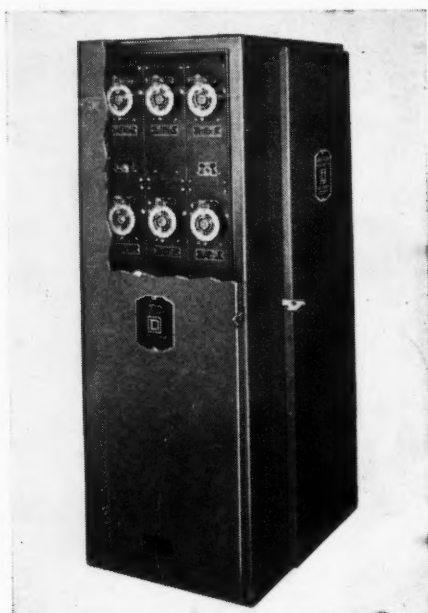
A chuck especially designed to increase production and lower the cost on short-run operations has been developed by the Standard Tool & Gage Co., a subsidiary of Jack & Heintz Precision Industries, Inc., Cleveland, Ohio. This new chuck, known as the "Standard-Hampton" speed chuck, is so designed that it can be opened and closed by a slight movement of the operating handle without stopping the motor or spindle. The operating handle can also be used for instantly stopping the spindle.

The chuck is designed to compensate for spindle run-out, and in most

instances, will allow close-tolerance chucking on any type of lathe. It is adaptable to fast feed-through operations, and will permit chucking to full spindle capacity up to 1 inch. An adjustable spacer or stop can be quickly installed and used as a part of the chuck when performing such operations as facing, threading, centering, drilling, or turning. The jaws can be quickly adjusted for close-tolerance concentric or eccentric turning operations, and will hold any size or shape of bar stock within their range.105

Combination Welder Control

Fully automatic control of air-operated resistance welding machines is provided by the new Class



Welder Control Made by Square D Co.

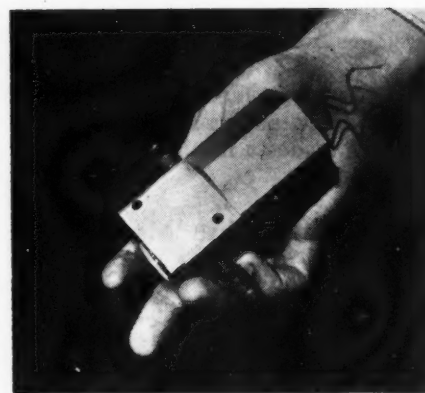
8992 combination control brought out by the Square D Co., 4041 N. Richards St., Milwaukee 12, Wis., which is designed to meet recently adopted NEMA standards. A "Synchro-Break" welder contactor and "Safront" sequence-weld timer are included in a single enclosure, arranged for mounting on the right-hand side of the welding machine.

Foot switch, pressure switch, no-weld switch, and timer-control circuits operate at 110 volts, and are isolated from the power supply as an added safety feature. A metal barrier between contactor and timer sections and the enclosure eliminates any possibility of flash-over between the power and control circuits. Combination controllers are designed with a control circuit which can be either separate or common with the power circuit.106

Electrol Solenoid-Operated Two-Way Valve

A new solenoid-operated two-way valve is now being produced for a wide variety of industrial uses by Electrol, Inc., 85 Grand St., Kingston, N. Y. This small compact unit provides a convenient remote control for hydraulic valves, which is especially adapted for installation in hard-to-reach or congested areas. The valve also has the advantage of being extremely light in weight and of rugged construction.

It has a capacity of 2 gallons per minute, and the pressure range is from a fraction of a pound per square inch up to 1500 pounds per square inch. Direct current of 12-24 volts is required to energize this solenoid. The weight of the valve is only 1 1/4 pounds, and it measures



Electrol Solenoid-operated Two-way Valve

3 9/16 inches long. The housing is made of aluminum-alloy bar stock, anodized, and has convenient ports and mounting holes which enable it to be easily attached in the operating position.107

* * *

Progress in Gas-Turbine Development

The rapid progress in gas-turbine development is indicated by the fact that one of the largest Government-sponsored aircraft gas-turbine experimental projects in the country is now being undertaken by the De Laval Steam Turbine Co., Trenton, N. J. The work will be carried out by the recently organized De Laval Aircraft Gas-Turbine Division. While details of the new aircraft gas turbine cannot yet be disclosed, because of Government restrictions, it is understood that the project involves, among other features, a new and unusual development in compressor and gas-turbine design.

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described in this section is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in September, 1946, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
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Fill in your name and address on blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

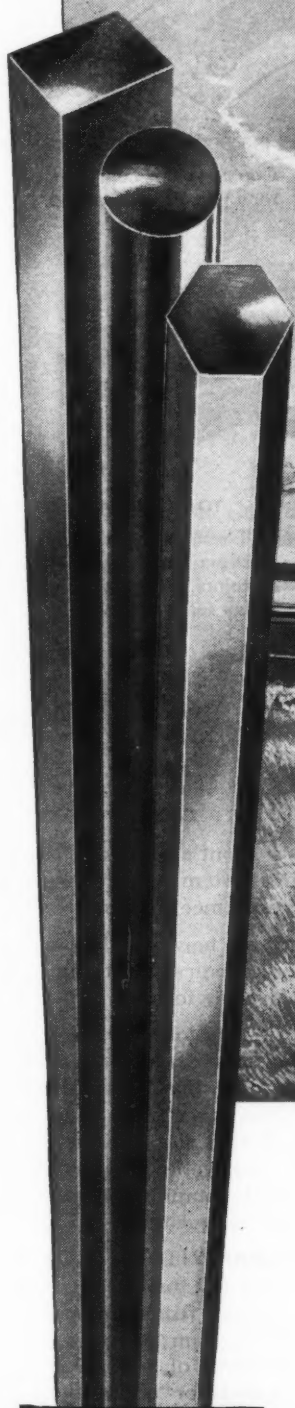
NAME.....POSITION OR TITLE.....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM.....

BUSINESS ADDRESS.....

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**J&L
STEEL**



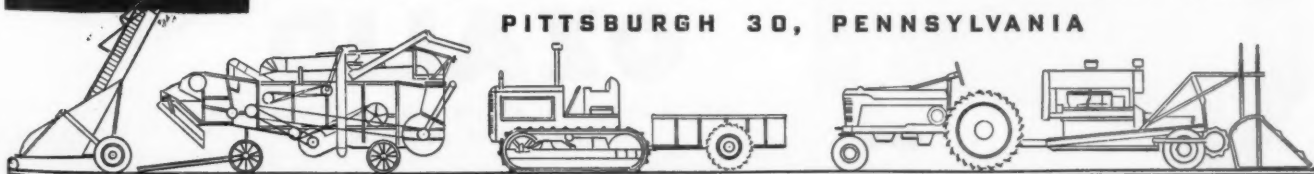
*For Easy Machining
of Precision Parts*
USE J&L COLD FINISHED STEEL

FARM COMBINE IN ACTION cutting grain, threshing it, elevating it to hopper bin to be placed in bags and picked up by truck. Many parts of Cold Finished steel are used in both tractors and combines, without which machinery today's great harvests would be impossible.

Experience and proper equipment are indispensable in the production of steels for cold working. At J&L the steel used in cold finishing operations is specially selected to be cold drawn, turned and ground, turned and polished or cold rolled. This is one reason why J&L Cold Finished steel is easy to machine, why you have fewer tool changes when making parts for agricultural implements, automobiles, home appliances and business machines. Write for information.

JONES & LAUGHLIN STEEL CORPORATION

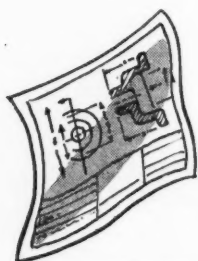
PITTSBURGH 30, PENNSYLVANIA





TO TYPISTS

Individually typed form letters are required.



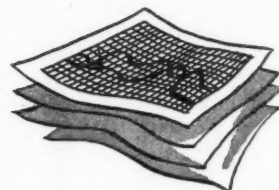
TO PRINTROOM

Prints of this draftsman's drawing must be made.



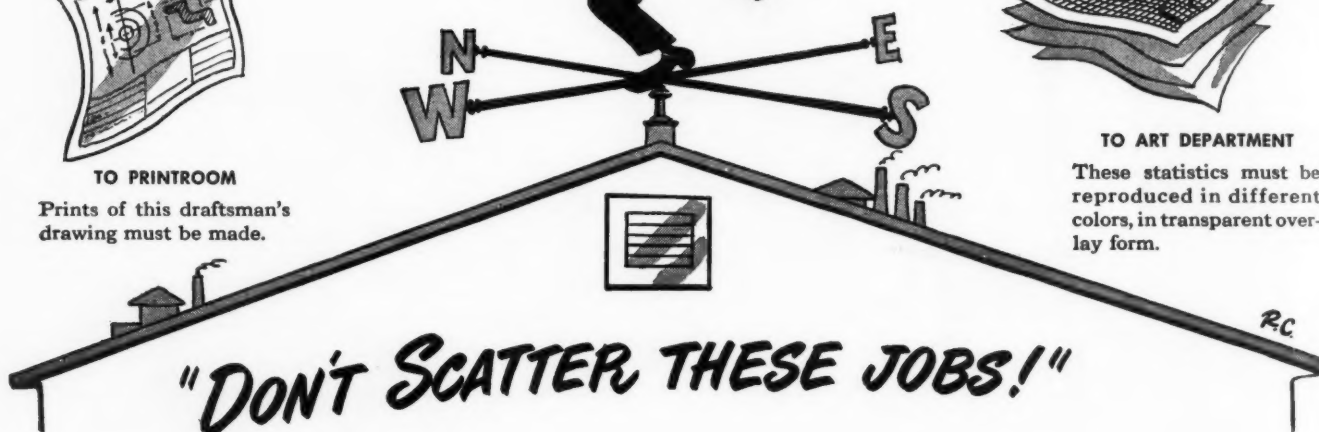
TO PHOTOGRAPHIC DEPARTMENT

Copies of this continuous-tone picture are needed.



TO ART DEPARTMENT

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"DON'T SCATTER THESE JOBS!"

It's not necessary to scatter jobs like these to the four winds!

Every one of them (and hundreds of others, besides) can be completed in a compact Ozalid machine, installed anywhere in your plant, and operated by anyone.

You'll find that Ozalid is the fastest, the most efficient, the *only* way to eliminate waste of time, labor, and materials in these everyday operations:

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Your letters will have the dignity of original typing . . . and

will cost only about a cent each. You'll use the same system to duplicate reports, minutes of meetings, etc.

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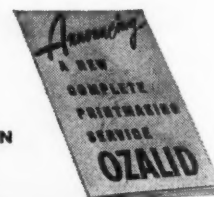
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JOHNSON CITY, NEW YORK

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New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 216 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the September, 1946, Number of MACHINERY

Steel

BISSETT STEEL CO., 945 E. 67th St., Cleveland, Ohio. Catalogue and handbook on cold-finished carbon bars, cold-finished and hot-rolled alloy bars, turned and ground shafting, tool steels, tool-steel tubing, drill rods, and spring and shim steel, together with a great deal of technical information in the form of a data book. 1

Metal Treating

MATHIESON ALKALI WORKS, 60 E. 42nd St., New York 17, N. Y. 40-page publication entitled, "Ammonia in Metal Treating," explaining the use of ammonia in nitriding, dry cyaniding, bright annealing, copper brazing, powder metallurgy, atomic-hydrogen arc-welding, and oxy-hydrogen arc-welding. 2

Furnaces for Descaling

A. F. HOLDEN CO., New Haven 8, Conn. Brochure on Holden furnaces for sodium-hydride descaling, covering the technical phases of the sodium-hydride process developed by Du Pont for descaling, together with description of suggested types of equipment. 3

Air Tools

ROTOR TOOL CO., Cleveland, Ohio. Booklet 30, on air grinders, drills, sanders, and nut setters, entitled "How to Cut Costs with Rotor Air Tools." The material is based on actual case studies at plants where portable tool costs have been reduced. 4

Gages

SIZE CONTROL CO., DIVISION OF AMERICAN MACHINE & GAGE CO., 2500 W. Washington Blvd., Chicago 12, Ill. Catalogue on plug and thread gages, snap gages, ring gages, twin

plug gages, and measuring wires, as well as on the company's new centerless lapping machine. 5

Resistance Welding

GENERAL ELECTRIC CO., Schenectady 5, N. Y. Bulletin GES 3388, entitled "Step up Production, Lower Costs with High-Speed Resistance Welding." Bulletin GEA-4571, entitled "The Importance of Control in Resistance Welding." 6

"Windows" Showing Lubrication Levels

BIJUR LUBRICATING CORPORATION, 43-01 Twenty-second St., Long Island City 1, N. Y. Bulletin 4B, on window units providing visibility of liquid level or flow, or for observing the operation of internal moving parts. 7

Resistance Welding Equipment

TAYLOR - WINFIELD CORPORATION, Warren, Ohio. Bulletin 2-413, on W type spot-welders. Bulletin 5-003, on air, hydraulically, and manually operated portable welders. Bulletin SP-1, entitled "Resistance Welders with Engineered Performance." 8

Air-Hydraulic Presses

AIR-HYDRAULICS, INC., 401 Broadway, New York 13, N. Y. 8-page bulletin covering air-hydraulic presses having ram pressure controlled up to 5000 pounds and an adjustable stroke of 1/16 inch to 5 inches, with adjustable ram speeds. 9

Engineering Services in Tool Design

U. S. ENGINEERING CO., 140 Nassau St., New York 7, N. Y. Folder containing a series of charts for determining sizes of "diamond pins" used to locate work in jigs and fixtures. 10

Ball Bushings

THOMSON INDUSTRIES, INC., 29-05 Review Ave., Long Island City 1, N. Y. Booklet illustrating and describing the newly developed "ball bushing" for linear motions. The booklet contains complete installation data and load ratings. 11

Cutters

INGERSOLL MILLING MACHINE CO., Rockford, Ill. Catalogue 55, covering the complete line of Ingersoll standard inserted-blade milling and boring cutters. Sections are included on carbide-tipped cutters and special cutters. 12

Grinding and Finishing

BEHR - MANNING CORPORATION, Troy, N. Y. Booklet entitled "Production Talks Backstands," describing and illustrating how backstands for polishing equipment increase production. 13

Grinding Wheels

WALTHAM GRINDING WHEEL CO., Waltham 54, Mass. Bulletin 16, entitled "Waltham Centerless—A Complete Service," giving detailed instructions on adjustments for in-feed and through-feed grinding. 14

Self-Locking Nuts

ELASTIC STOP NUT CORPORATION OF AMERICA, 2330 Vauxhall Road, Union, N. J. Booklet entitled "A Procedure for Testing the Locking Effectiveness of Self-Locking Nuts and Related Fastening Devices." 15

Clamps, Pliers, and Wrenches

KNU - VISE CORPORATION, 2200 Eighth St., Detroit 16, Mich., and 4328 San Fernando Road, Glendale, Calif. 16-page condensed catalogue covering toggle-action clamps, pliers, and wrenches. 16

Gaging and Inspection

ENGINEERS SPECIALTIES DIVISION, UNIVERSAL ENGRAVING & COLOR-PLATE CO., INC., 980 Ellicott St., Buffalo 8, N. Y. Folder entitled "Gage 18 Dimensions in 15 Seconds by Optical Projection."17

Vibro-Insulators

B. F. GOODRICH CO., INDUSTRIAL PRODUCTS DIVISION, Akron, Ohio. Booklet on vibro-insulators—devices of rubber and metal to cushion industrial equipment and reduce vibration and noise.18

Meehanite for Permanent Molds

MEEHANITE METAL CORPORATION, 800 Pershing Square Bldg., New Rochelle, N. Y. Bulletin 23, entitled "Meehanite—the Metal for Permanent Molds."19

Welding Electrodes

METAL & THERMIT CORPORATION, 120 Broadway, New York 5, N. Y. Bulletin containing data on a new type of Murex electrode designed to prevent under-bead cracking in performing difficult welding jobs.20

Precision Castings

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis. Bulletin 19B6451, on the advantages of precision castings made from materials difficult to machine or forge.21

Wood Screw Machinery

ASA S. COOK CO., 1460 Elmwood Ave., Providence 7, R. I. Bulletin on wood screw machinery—open-die headers, shavers and slotters, and threaders and pointers.22

Alloys

ALLOY METAL WIRE CO., INC., Prospect Park, Pa. Catalogue D-2,

on wire, rod, and strip of nickel alloys, giving engineering data, size and weight tables, etc.23

Lubricants

SUN OIL CO., Philadelphia 3, Pa. Folder entitled, "Suntac—the Lubricant that Stays Where You Want It," giving case histories of the use of Suntac in industry.24

Plastics

E. I. DU PONT DE NEMOURS & CO., INC., 626 Schuyler Ave., Arlington, N. J. Booklet entitled "Du Pont Plastics," giving characteristics and properties of various types.25

Carbide Tools

WILLEY'S CARBIDE TOOL CO., 1340 W. Vernor Highway, Detroit 1, Mich. Catalogue 29, on tungsten-carbide cutting tools, blanks, gages, centers, dies, and carbide tool grinders.26

Air Compressors

AMERICAN BRAKE SHOE CO., KELLOGG DIVISION, Rochester 9, N. Y. Folder showing methods of reducing operating and power costs in the use of compressed air.27

Steel Die Sets

STANDARD MACHINERY CO., Providence 7, R. I. Catalogue Section DS, on steel die sets, feeds, scrap cutters, straighteners, and ground plates.28

Carbide-Tipped Tools

SCHMARJE TOOL & ENGINEERING CO., Muscatine, Iowa. Catalogue 146, on carbide-tipped reamers, counterbores, spot-facers, form tools, and centers.29

Time Switches

AUTOMATIC TEMPERATURE CONTROL CO., INC., 34 E. Logan St., Philadel-

phia 44, Pa. Bulletin T-55, on special-built time switches for the volume user.30

Welding Rod

EUTECTIC WELDING ALLOYS CORPORATION, 40 Worth St., New York 13, N. Y. Bulletin descriptive of a new type of welding rod that was used in solving difficult wartime welding problems.31

Refractories

CHAS. TAYLOR SONS CO., Department S, Cincinnati, Ohio. Bulletin 201, on refractories for high-temperature service and special applications.32

Permanent-Mold Casting

EATON MFG. CO., 9771 French Road, Detroit 13, Mich. Booklet describing the Eaton permanent-mold process for producing gray iron castings.33

Molding Machines for Plastics

WATSON-STILLMAN CO., Roselle, N. J. Bulletin on transfer molding machines for plastics of 50 to 1200 tons capacity.34

Self-Lubricating Bearings

NOLU OILLESS BEARING CO., 18 E. Johnson St., Germantown 44, Philadelphia, Pa. Bulletin on self-lubricating machinery bearings.35

Blowers, Fans, and Exhausters

GENERAL BLOWER CO., Morton Grove, Ill. Catalogue entitled "Lungs for Industry," covering exhausters, blowers, fans, and ventilators.36

Spray Equipment

ECLIPSE AIR BRUSH CO., Newark 7, N. J. 44-page catalogue describing Eclipse low-pressure spray equipment for industrial applications.37

To Obtain Copies of New Trade Literature

listed in this section (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue (September, 1946) to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
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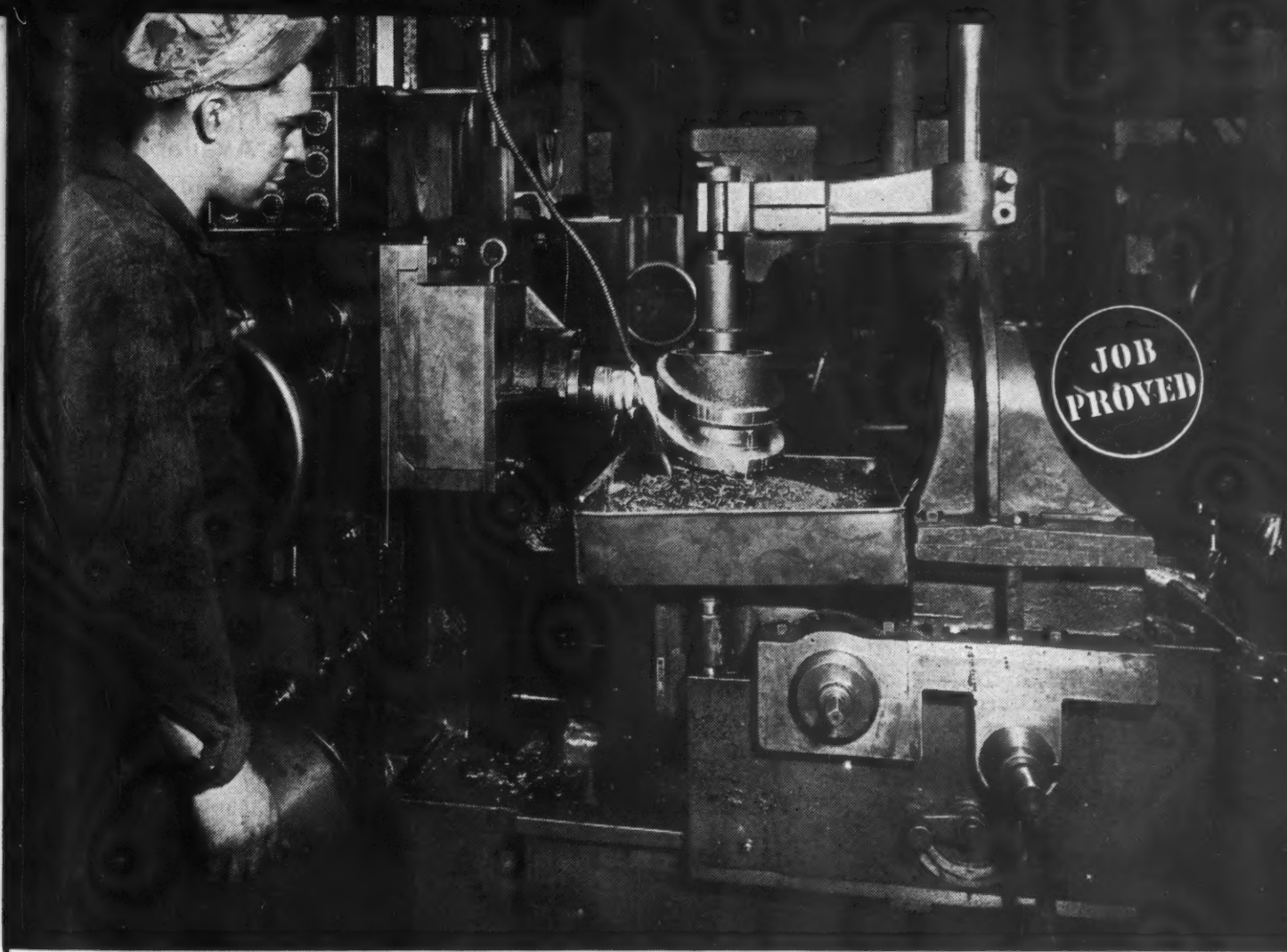
NAME..... POSITION OR TITLE.....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

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CUTTER LIFE DOUBLED ... *Costs cut 25%*

SUNOCO EMULSIFYING CUTTING OIL

Used for Milling Cams, Eliminates Stains and Odor, Produces Better Finish

A well-known machine-tool builder, in the cam-milling operation shown above, was not obtaining satisfactory finish. The cutting emulsion had an objectionable odor and had to be changed every two weeks.

Lubrication costs were cut 25% when they changed to Sunoco Emulsifying Cutting Oil for both milling and grinding. The new oil lasts more than four times as long. Cutter life has doubled. Finish has improved. Objectionable odor eliminated.

The facts: Machine: Rowbottom cam miller
Operation: Milling cams
Material: Air-cooled alloy steel casting
Depth of cut: $\frac{1}{8}$ "

Tool: High-speed Weldon end mill
Cutting Lubricant: 1 part Sunoco to 15 parts water

In hundreds of shops Sunoco Emulsifying Cutting Oil has been "Job-Proved." It mixes easily with water. Its high cooling and lubricating qualities are important wherever ferrous or non-ferrous materials must be cut with precision and at high speed.

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Sponsors of the Sunoco News-Voice of the Air — Lowell Thomas

SUN
— **SUNOCO** —

**INDUSTRIAL
PRODUCTS**

Work-Holding Clamps

McFERRON-MYERS PRODUCTS Co., 308 Euclid Ave., Cleveland 14, Ohio. Bulletin entitled "Duo-Square Work-Holding Clamps Cut the Big Cost!", describing time-saving clamps.....38

High-Production Presses

E. W. BLISS Co., 450 Amsterdam St., Detroit 2, Mich. Catalogue 27-A, on high-production presses made in sizes of 8 to 300 tons.39

Tachometers

BRISTOL Co., Waterbury 91, Conn. Bulletin S 1400, on tachometers for recording and indicating speed of rotation and speed of travel.....40

Furnaces

SURFACE COMBUSTION CORPORATION, Toledo 1, Ohio. Bulletin SC-131, on hardening in the corporation's standard rated furnaces.41

Metal-Sawing Machines

PEERLESS MACHINE Co., Racine, Wis. Bulletin MC-51A, on Mechanicut precision metal-sawing machines, with or without bar feed.42

Hard-Facing Alloys

WALL COLMONOY CORPORATION, 720 Fisher Bldg., Detroit 2, Mich. Engineering Data Sheets on Colmonoy hard-facing alloys.43

Pyrometers

WHEELCO INSTRUMENTS Co., 847 W. Harrison St., Chicago 7, Ill. Bulletin D602-4, on a complete line of portable pyrometers.44

Electrode Application Chart

AMPCO METAL, INC., 1745 S. 38th St., Milwaukee 4, Wis. "Ampco-Trode Industrial Application Chart," published in Spanish.45

Engine-Lathe Tooling

KYLE-JOHNSON MACHINE Co., 1627 W. Pico Blvd., Los Angeles 15, Calif. Folder on K-J quick-change system of lathe tooling.46

Carbide Expanding Reamers

METRO TOOL & GAGE Co., 4240 W. Peterson Ave., Chicago 30, Ill. Bulletin on heavy-duty carbide expanding reamers.47

Materials Testing

W. C. DILLON & Co., INC., 5410 W. Harrison St., Chicago 44, Ill. Brochure on the Model K universal tester.48

Counterbores

CONTINENTAL TOOL WORKS, DIVISION OF EX-CELL-O CORPORATION, Detroit 6, Mich. Bulletin on counterbore sets.49

Nickel Silver

AMPCO METAL, INC., 1745 S. 38th St., Milwaukee 4, Wis. Bulletin on Ampcoloy nickel silver, a stainless white alloy.50

Clamps

MARMAN PRODUCTS Co., INC., 940 W. Redondo Blvd., Inglewood, Calif. Catalogue of clamps for a variety of purposes.51

Castings

SHENANGO-PENN MOLD Co., Dover, Ohio. Bulletin entitled "Centrifugal and Static Castings of Plain or Alloyed Irons."52

Tool Steel

JESSOP STEEL Co., Washington, Pa. Bulletin on Jessop Type R composite tool steels.53

Arc-Welding Machines

HOBART BROTHERS Co., Troy, Ohio. Folder on Hobart simplified arc-welders.54

* * *

New Officers of Malleable Founders' Society

At a recent meeting of the Malleable Founders' Society, Union Commerce Bldg., Cleveland, Ohio, Frank E. Shumann of Lehigh Foundries, Inc., Easton, Pa., was elected president; Wilson Moriarty of the National Malleable & Steel Castings Co., Cleveland, Ohio, vice-president; H. S. Colby, executive vice-president; and John J. Harant, secretary-treasurer.

During the coming year, in addition to the general meetings which the members from all parts of the country attend, it is contemplated to hold eastern and western sectional meetings monthly. Plans have been worked out for the presentation of papers bearing on the work of the foundry industry at each of these meetings. The Committee on Education will continue, during the coming year, to encourage engineering students who are particularly interested in the casting field to equip themselves for this branch of the industry, and to interest students in secondary technical schools in the foundry industry as well.

New Edition of Pipe-Thread Standards Available

The American Standards Association, 70 E. 45th St., New York 17, N. Y., has announced a new edition of the "Pipe Thread Standard" approved by the Association as an American standard. The first data appearing as a complete standard on pipe threads was published in the *Transactions* of the American Society of Mechanical Engineers in 1919. This compilation was later approved by the American Standards Association as the first American standard and was published by the American Society of Mechanical Engineers as ASA B2-1919. The first revision of this standard was published in 1942 and identified as ASA B2.1-1942.

Due to the need for additional data on pipe threads and gaging during the recent war, a further revision was undertaken which has resulted in the present new edition of the pipe thread data, known as American Standard B2.1-1945. This revision provides the necessary information on the subject of pipe threads for any purpose requiring some form of pipe thread—tapered or straight—for any services from that known as "general service" to that demanding more exacting gaging practice.

The standard now published also includes the fundamentals for the "Dryseal Pressure-Tight Joints." The close requirements for this type of pipe thread were developed during a period of years for service where the use of any lubricant or sealer was considered undesirable. The details for crests and roots are the only differences between the "Dryseal" and the regular thread. The advantages to be gained by the "Dryseal Joint" are illustrated in the published material. Copies of the new edition of these pipe thread standards are available from the American Standards Association at the address given above.

* * *

The General Motors Corporation has estimated that, in order to provide a worker with a place to work and with the necessary tools and machine equipment, \$6500 must be saved up and invested by someone. The fact that machines, tools, and a place to work have to be provided through somebody else's savings is too frequently overlooked by well meaning statesmen who do not comprehend how industrial production gets under way.

Scores of Tough Jobs Prove
KENNAMETAL
K6
Machines CAST IRON
with Maximum Economy



Kennametal Grade K6 is one of the most useful and needed recent developments in tool materials for machining cast iron and non-ferrous metals. It is an improved tungsten carbide having unusual strength in combination with exceptional abrasion-resistance and high hardness. The four performance studies outlined below are typical of scores of comparative service results that clearly show the superior properties of K6 for interrupted and continuous cutting on cast iron.

Turns out 10 times as many pieces, on rough casting, between regrinds

One to four pieces between grinds was the best performance recorded by other carbides on machining a webbed flange of inferior grade cast iron, having hard spots, and sand pockets. K6 turns out more than 40! Operation—turning outside diameter and facing both sides of hub and rim. Feed—.032" Depth of cut 1/16" to 3/8" SFM-280.

The best way to prove that K6 makes possible better, faster machining on cast iron, at lower tool costs, is to try it in your own shop—then compare tool performance and overall costs. Order a few Kennametal blanks, or complete tools, now—and ask our district field engineer, who is fully acquainted with the properties of K6, to help you get maximum results from this new and improved tungsten carbide—Kennametal Grade K6.

Removes tons of metal from chilled cast iron parts, at tool cost of 74¢ per ton

Style 12 Tool with K6 tip turns 1½ lineal miles between grinds! Other makes of carbide failed at all speeds and feeds. After 10 regrinds K6 tip is used on lighter jobs. Operation—turning cast iron piston trunks, 21½" diameter, having six 3" or 4" ports (interrupted cut). Chilled around port holes. Very sandy surface. Feed—.09375". Depth of cut—½". SFM-120.

Multiplies output, on facing operation, on sandy iron casting

Replacing another make of carbide with a Style 11HD Tool having a clamped-on, advanceable K6 tip, made possible tripling the feed, doubling the cutting speed, and facing 8 times as many pieces per regrind. Operation—facing sandy iron castings. Feed—.036". Depth of cut—¼" to 3/16" SFM-150 at start, 320 after tool entered cut.

Cuts 35 pieces (on Abrasive Electric Iron) as against 3 for carbide previously used

This unique tool, tipped with Kennametal K6, turns out 11½ times as much work between grinds as the carbide tool previously used. Operation—finish trepanning cut on electric iron part. Feed—.003". SFM-210. Accurate tolerances and good finish required, and produced.



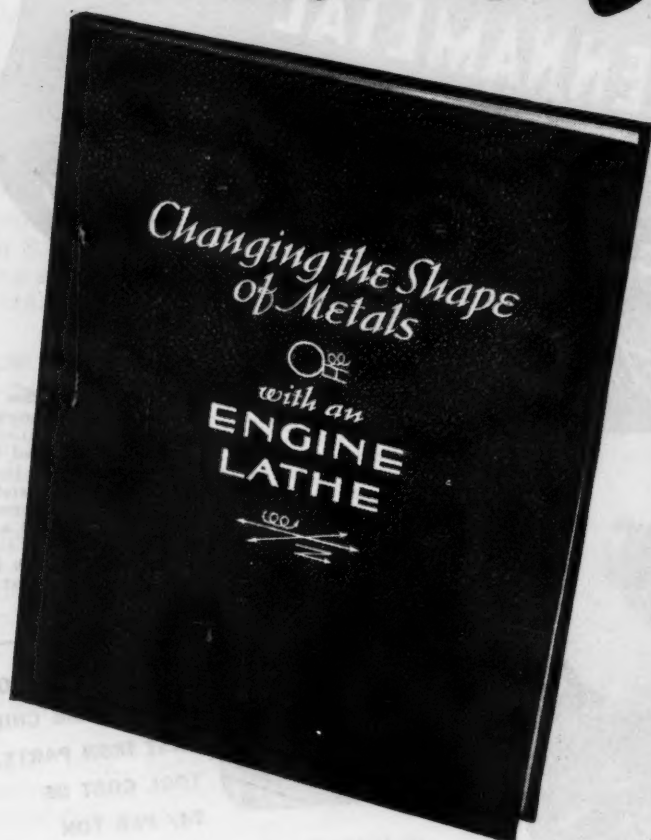
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SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

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SHELL INDUSTRIAL SERVICE!



By all means, see this book!

Here are the chapter headings:

1. Fundamentals of Modern Machine Tools.
2. Features of Similarity of Modern Lathes.
3. Getting Acquainted with an Engine Lathe.
4. Getting Acquainted with Lathe Tools.
5. Performing Common Lathe Operations.
6. Common Lathe Jobs and How to Produce Them.
7. Getting the Most Out of an Engine Lathe.
8. Cutting Fluids.

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MACHINERY'S DATA SHEETS 569 and 570

DIE STEELS FOR COLD-WORKING DIES—1

Type of Steel	Characteristics	Tendency* Distortion	Comparative Wear Resistance†	Relative Toughness‡	Relative Ease of Machining§
Water-Hardening Straight Carbon (with 0.8 to 1.1 per cent C)	High hardness; low hardening temperature; shallow hardening; depth of hardening can be specified and controlled; easily machined and ground. Insufficient case depth for many jobs; danger of soft spots; risk of cracking and warping; insufficient wear resistance for long runs.	1	1	6	6
Carbon-Vanadium (carbon steel with about 0.25 per cent V)	Compared with straight carbon steel, carbon-vanadium steel has finer grain and wider hardening range; greater toughness; shallower depth of hardening; case depth can be increased by quenching from higher temperatures.	2	1	7	6
Oil-Hardening Manganese (1 per cent Mn with Cr and W; and 1 1/2 per cent Mn with Mo)	Low hardening temperature; little danger of cracking even in intricate sections; low distortion; easy to machine and grind; moderately deep hardening; fair wear resistance and ability to hold cutting edge; low toughness.	3	2	3	5
High-Carbon, High-Chromium (2.2 per cent C, 12 per cent Cr)	High hardening temperature; little danger of cracking; low distortion; difficult to machine and grind; deep hardening; superlative wear resistance and compressive strength; low toughness.	5	6	1	1

*For signification of the numbers in the right-hand columns, see notes at bottom of Data Sheet No. 570.

NOTE: The distortion and toughness ratings of water-hardening steels depend on the relative proportions of hard case to tough core. The case expands, while the core contracts. Certain water-hardening dies may be so proportioned as to show negligible change. Similarly, the case is quite brittle; but with sufficient core beneath it, the die will be very tough.

MACHINERY'S Data Sheet No. 569, September, 1946

Compiled by G. M. Butler, Allegheny Ludlum Steel Corporation, Pittsburgh, Pa.

DIE STEELS FOR COLD-WORKING DIES—2

Type of Steel	Characteristics	Distortion Tendency*	Comparative Wear Resistance†	Relative Toughness‡	Relative Ease of Machining§
Air-Hardening Manganese-Chromium-Molybdenum (2 to 3 per cent Mn; 1 to 2 per cent Cr; 1 per cent Mo)	Low hardening temperature; negligible cracking hazard; least distortion of all tool steels; rather difficult to machine; quite easy to grind; deep hardening; moderately tough; somewhat better wear resistance than manganese oil-hardening steel; limited availability.	7	3	4	3
Chromium-Molybdenum (5 per cent Cr; 1 per cent Mo)	Intermediate hardening temperature; negligible cracking hazard; low distortion, but more than manganese-chromium-molybdenum; deep hardening; toughest of all alloy die steels; wear resistance about like that of manganese-chromium-molybdenum steel.	4	4	5	4
High-Carbon, High-Chromium (1.5 per cent C; 12 per cent Cr; with some Mo)	High hardening temperature; negligible cracking hazard; almost as low distortion as manganese-chromium-molybdenum steel; deep hardening; low toughness; excellent wear resistance.	6	5	2	2

*The figure 1 represents the greatest tendency toward distortion; 7, the least tendency.

†1 stands for the lowest wear resistance value; 6, highest wear resistance.

‡1 stands for the lowest toughness; 7, greatest toughness.

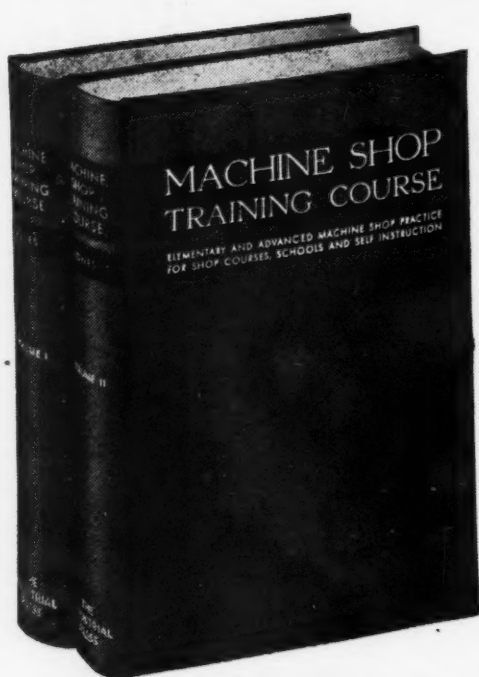
§1 stands for steel most difficult to machine; 6, for steel easiest to machine.

MACHINERY'S Data Sheet No. 570, September, 1946

Compiled by G. M. Butler, Allegheny Ludlum Steel Corporation, Pittsburgh, Pa.

Machine Shop Training Course

WITH BLUEPRINT READING CHARTS



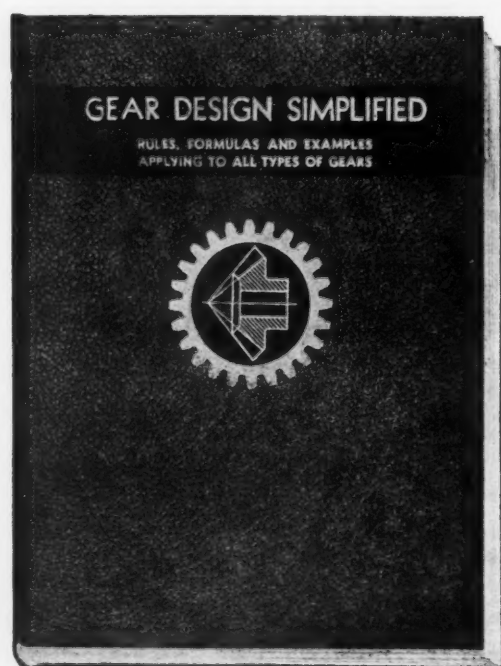
**Price \$6 Set—Payable \$2
with Order, \$2 Monthly**

This standard treatise on machine shop practice in two volumes is for the shop man who wants to supplement his own experience with a broad fund of practical knowledge; for use as a textbook and guide in shop training courses; for technical or trade schools; for designers who want the fundamentals of machine shop practice; for mechanical engineering students.

The MACHINE SHOP TRAINING COURSE contains over 1100 pages of questions and answers. These questions deal with the elements of machine shop practice and other subjects closely allied to the work of the shop. The answers are packed with useful facts, shop rules, typical shop problems and their solutions. 524 drawings and photographs illustrate all kinds of machining operations, cutting tools, gages, etc.

THE INDUSTRIAL PRESS, 148 Lafayette Street, New York 13, N. Y.

Gear Design Simplified



Size 8-1/2 x 11 Inches

This book of working rules and formulas for designer and shop man, deals with spur gears, internal gears, straight-tooth and spiral-bevel gears, single- and double-helical gears, worm-gears, gear ratios (including transmissions of the planetary type) and the power-transmitting capacity of gears.

All gear problems are presented in simple chart form. These 110 charts, with 201 drawings illustrating all kinds of gear problems, are easy to use and you can locate quickly whatever rule or formula is desired. Worked-out examples of gear design show exactly how all rules (or the formulas, if preferred) are actually applied in obtaining the essential dimensions, angles, or other values.

Price \$3 copy.

THE INDUSTRIAL PRESS, 148 Lafayette Street, New York 13, N. Y.

News of the Industry

California

JOSEPH T. RYERSON & SON, INC., Chicago, Ill., announces the establishment of a new steel-service plant on the West Coast, located in the Central Manufacturing District, southeast of Los Angeles, Calif., fronting on Bandini Boulevard. The warehouse building covers an area of 200,000 square feet, made up of seven spans, two of which are 600 feet long. A two-story office building having a floor area of 12,000 square feet adjoins the warehouse.

JOHN G. THOMPSON has been appointed sales and service representative in California and Nevada for the REED-PRENTICE CORPORATION, Worcester, Mass., manufacturer of plastic injection molding machines and die-casting machines. Mr. Thompson will be available at the offices of the Moore Machinery Co., Los Angeles 11, Calif., whose activities in behalf of the Reed-Prentice organization he will take over about October 10. His mail address is Hotel Mayflower, Los Angeles, Calif.

HARVEY E. SCHROEDER, formerly district sales manager in Los Angeles for the Parker Appliance Co. of Cleveland, Ohio, has been appointed manager of the newly created Pacific Division of the company at Los Angeles. Mr. Schroeder joined the Parker organization in 1941.

ED. J. TOWEY has been appointed sales manager of the Industrial Division of the Adel Precision Products Corporation, Burbank, Calif. Mr. Towey was formerly executive vice-president of the Diamond Iron Works of Minneapolis, Minn.

EVERETT B. EVLETH has been made president of the Ray Control Co., Pasadena, Calif. Mr. Evleth was formerly for eight years vice-president and general manager of the Brown Instrument Co., Philadelphia, Pa.

THEODORE K. BURGENBAUCH, formerly with the General Electric Co., Schenectady, N. Y., has been appointed Electronics Division production manager for the Ellinwood Industries, Los Angeles, Calif.

STERLING ELECTRIC MOTORS, INC., Los Angeles 22, Calif., is adding a 22,000-square-foot unit to its present three-acre plant, and expects to expend about \$600,000 in modernization and new buildings.

OAKLAND ENGINEERING CO., INC., Oakland, Calif., maker of air and hydraulic cylinders, has moved to its new factory at 800 One Hundredth Ave., Oakland, Calif.

Connecticut

EARL S. PATCH and C. ROBERT TALMAGE have formed the partnership of PATCH & TALMAGE to serve industrial companies in the field of powder metallurgy. The offices and laboratory of the new organization are located at 4 South St., Stamford, Conn. Mr. Patch was formerly engineering and sales manager for the Moraine Products Division of General Motors, and more recently sales manager of the Micro-Ferrocart Products Division of Maguire Industries. Mr. Talmage was also associated with General Motors Moraine Products Division, in engineering, sales, and personnel positions, and later acted as assistant chief engineer of the Micro-Ferrocart Products Division of Maguire Industries.

ALEXANDER S. KELLER, vice-president and manager of foreign sales of the Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn., is making a tour of a number of countries in western Europe on behalf of Pratt & Whitney. He is also chairman of the Committee on Foreign Sales of the National Machine Tool Builders' Association. Mr. Keller sailed for England on July 9, and is expected to return to this country by the end of September. In addition to England, he expects to visit Sweden, Finland, Holland, France, Belgium, Switzerland, and Italy.

LIEUTENANT COMMANDER WILLIAM R. BOWEN has returned to the Farrel-Birmingham Co., Ansonia, Conn., after serving three and a half years in the U. S. Navy as executive officer of the Ordnance Gage Division at the Naval Gun Factory at Washington, D. C. He is now manager of the Farrel-Birmingham Co.'s branch sales office at Akron, Ohio. He succeeds HARRY T. TEMPORAL, who will manage the organization's office in Chicago.

MAURICE D. BENNETT has been appointed superintendent of research for the Stamford Division of the Yale & Towne Mfg. Co., Stamford, Conn., succeeding the late Charles C. Ledin. Mr. Bennett joined the Yale & Towne organization in 1927, following his graduation from Pratt Institute.

JAMES H. CHASMAR has resigned from the Remington Arms Co., Inc., Bridgeport, Conn., after twenty-six years as an executive with this organization, in order to enter the consulting field as a management counselor. He has established offices at 177 State St., Bridgeport, Conn.

JOHN D. FOLEY, formerly superintendent of the Remington Arms plant at Bridgeport, Conn., has been appointed

works manager of the H. O. Canfield Co., Bridgeport, Conn., manufacturer of mechanical rubber goods.

FONDA GAGE Co., Stamford, Conn., has appointed A. C. WICKMAN (Canada) LTD., New Toronto, Ontario, Canada, as sole Canadian representative for Fonda carbide gage-blocks and ultra-finish steel gage-blocks.

M. K. SCHNURR has been made a vice-president of the Bridgeport Brass Co., Bridgeport, Conn. Before becoming connected with the Bridgeport Brass Co., Mr. Schnurr was associated with the New York Trust Co.

Illinois and Missouri

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa., is planning the erection of a plant at Des Plaines, Ill., for the manufacture of aluminum die-castings. According to present plans, the plant will have a floor space of approximately 190,000 square feet, and will employ from 400 to 500 workers. It will be built on a 35-acre site so that possible future expansion might nearly double the plant area and employment.

GEORGE B. COFFEY has been appointed manager of the Chicago division of the A. M. Byers Co., Pittsburgh, Pa., manufacturer of wrought iron. The Chicago division includes Michigan, Minnesota, North and South Dakota, Wisconsin, Iowa, Indiana, and parts of Illinois and Ohio. Mr. Coffey succeeds W. A. TAYLOR, who has resigned to enter private business. He will have offices in the Conway Building, Chicago.

WALLACE TUBE Co., a wholly owned subsidiary of the WALLACE SUPPLIES MFG. Co., Chicago, Ill., has been organized for the distribution of various types of industrial tubing and fittings. The new company will carry warehouse tubing as distributors for the BETHLEHEM STEEL Co., PITTSBURGH STEEL Co., GLOBE STEEL Co., AGALLOY TUBING Co., LOCK JOINT TUBE Co., and PARKER APPLIANCE Co.

LUKENS STEEL Co. and its subsidiaries, BY-PRODUCTS STEEL CORPORATION and LUKEWELD, INC., Coatesville, Pa., have opened a district sales office in the McCormick Building, 332 S. Michigan Ave., Chicago 4, Ill., under the management of JOHN H. FAUNCE, JR. The office will handle most of the territory formerly served by A. M. CASTLE & Co., sales representatives.

CAL-THERM INDUSTRIES, INC., Chicago, Ill., manufacturer of electrical appliances, has acquired the FRED W. GEHRER Co., also of Chicago—one of the oldest

metal-spinning and specialties firm in that territory. The two businesses will be merged, with offices and manufacturing facilities located at 3542 W. Grand Ave., Chicago.

ROBERT L. SPRINGER, formerly sales and service engineer for the Vanadium-Alloys Steel Co., and for the last seven years Chicago sales manager of the Rustless Iron & Steel Co. and the Geary Stainless Steel Co., has returned to the Vanadium-Alloys organization as engineer and representative in the Chicago district.

MOORE PRODUCTS Co., Philadelphia, Pa., has opened a branch office for northern Illinois, northern Indiana, Wisconsin, and eastern Iowa at 105 W. Monroe St., Chicago 3, Ill. JACK J. FREGEAU will be in charge of sales and service of both Nullmatic industrial instruments and Moore pneumatic comparator gages.

JOHN S. BARNES CORPORATION, Rockford, Ill., has announced that the Chicago branch office at 135 S. LaSalle St., will be in charge of E. C. HAWKINS, who will have direct supervision over hydraulic sales in that territory. He was formerly manager of the company's eastern sales office at Newark, N. J.

TACO ENGINEERING Co., 2620 S. Park Ave., Chicago, Ill., has been formed by THEODORE A. COHEN, as a consulting, designing, and manufacturing organization specializing in electronic and electro-mechanical automatic control equipment for industrial process control and automatic machine processes.

HYSTER Co., Portland, Ore., announces that its new Danville, Ill., plant is now manufacturing lift trucks. FRANK L. ROSS, vice-president in charge of all eastern activities of the Hyster Co., is in charge of the plant.

NORMAN H. SHIPLEY has been appointed district manager of the Madison, Ill., plant of the American Car & Foundry Company.

W. N. REMSBURG has been made chief engineer of the Sanitary Division of the American Well Works, Aurora, Ill. He has been connected with that organization for twelve years.

CARL E. BOLTE, newly appointed executive secretary of the National Lubricating Grease Institute, is located at Kansas City, Mo. (the headquarters of the Institute), instead of at Buffalo, N. Y., as erroneously reported in August MACHINERY.

Indiana

R. C. OSGOOD, chief engineer and manager of the Sullivan Hoist Division of the Joy Mfg. Co., Michigan City, Ind., has received special recognition from the Navy Department in the form of a certificate in appreciation of exceptional

service to naval ordnance development. This was awarded him as part of the Naval Ordnance Development Award recently conferred on the Sullivan Division of the Joy Mfg. Co. J. A. DRAIN, vice-president in charge of engineering, was also given special recognition; and the work of ALTON HILLIARD, assistant to Mr. Osgood, was recognized with a similar award to his widow.

RALPH R. NEWQUIST has been elected vice-president in charge of sales of the Roots-Connersville Blower Corporation, Connersville, Ind.

Massachusetts

B. C. AMES Co., Waltham 54, Mass., has recently been reorganized with WARREN AMES as president and H. G. HAYNES as treasurer. This forty-seven year old concern will continue the manufacture and sale of the company's well-known micrometer dial gages and indicators. The B. C. Ames Co. has sold its manufacturing rights to the Ames bench lathes, milling machines, and hardness testers to the AMES PRECISION MACHINE WORKS, Waltham 54, Mass., of which concern IRA R. AMES is the head.

REED-PRENTICE CORPORATION, Worcester, Mass., has made arrangements with ALFRED HERBERT, LTD., Coventry, England, to have a complete line of plastic injection molding machines and die-casting machines manufactured under license in England. Alfred Herbert, Ltd., has, in turn, contracted with TH. & J. DANIELS LTD.; FRANCIS SHAW Co.; and HYDRAULIC ENGINEERING Co., for the manufacture of these machines.

GEORGE L. ABBOTT has been made president, treasurer, and general manager of the Warren Belting Co., Inc., 33 Arctic St., Worcester, Mass. Mr. Abbott was previously vice-president and general sales manager of the Graton & Knight Co. of Worcester.

Michigan

DETROIT BROACH Co., Detroit, Mich., has appointed ERNEST A. ISBERG, 1063 Commercial Trust Bldg., Philadelphia, Pa., representative for southern New Jersey, Delaware, Maryland, Philadelphia and southeastern Pennsylvania, and the District of Columbia. SAM H. PENNY, Box 1271, Houston, Tex., has been made representative in southeastern Texas. HENRY E. ROEDTER, 1623 Carew Tower, Cincinnati, Ohio, will handle southern Ohio and Kentucky. JAMES WEBB, formerly assistant chief engineer of the Detroit Broach Co., has been appointed sales engineer to work in cooperation with all the representatives of the Detroit Broach Co. throughout the United States.

HAROLD T. YOUNGREN has been made director of engineering of the Ford Motor Co., Dearborn, Mich. Mr. Young-

ren comes to the Ford organization from the Borg-Warner Corporation of Chicago, where he has been chief of engineering development since 1944. R. H. MCCARROLL, formerly executive engineer, has been made director of chemical and metallurgical engineering and research of the Ford Motor Co.

WILLIAM F. MCGRAW & Co., Detroit distributors of specialized industrial supplies, recently occupied their new building at 575 E. Milwaukee St., Detroit, Mich. The building contains more than 10,000 square feet, and was constructed to fit the special needs of the company's sales and engineering service on cutting tools, coated abrasives, socket-head screws, and allied products.

GUS GRAN has been made assistant sales manager and BEN. F. WELTE assistant chief engineer of Colonial Broach Co., Detroit, Mich. Mr. Gran has been with the Colonial organization for the last thirteen years, more recently as assistant chief engineer. Mr. Welte, who joined the Colonial organization in 1932, has been acting as research engineer for several years.

LINCOLN PARK INDUSTRIES, INC., Lincoln Park, Mich., has inaugurated a new department for the manufacture of carbide dies, adding this product to its present lines of carbide gages, precision tools, and special fixtures.

DR. WILLIAM L. MCCracken has been appointed administrative assistant to C. F. DINLEY, Sr., vice-president in charge of research and engineering of the Detrex Corporation, Detroit, Mich.

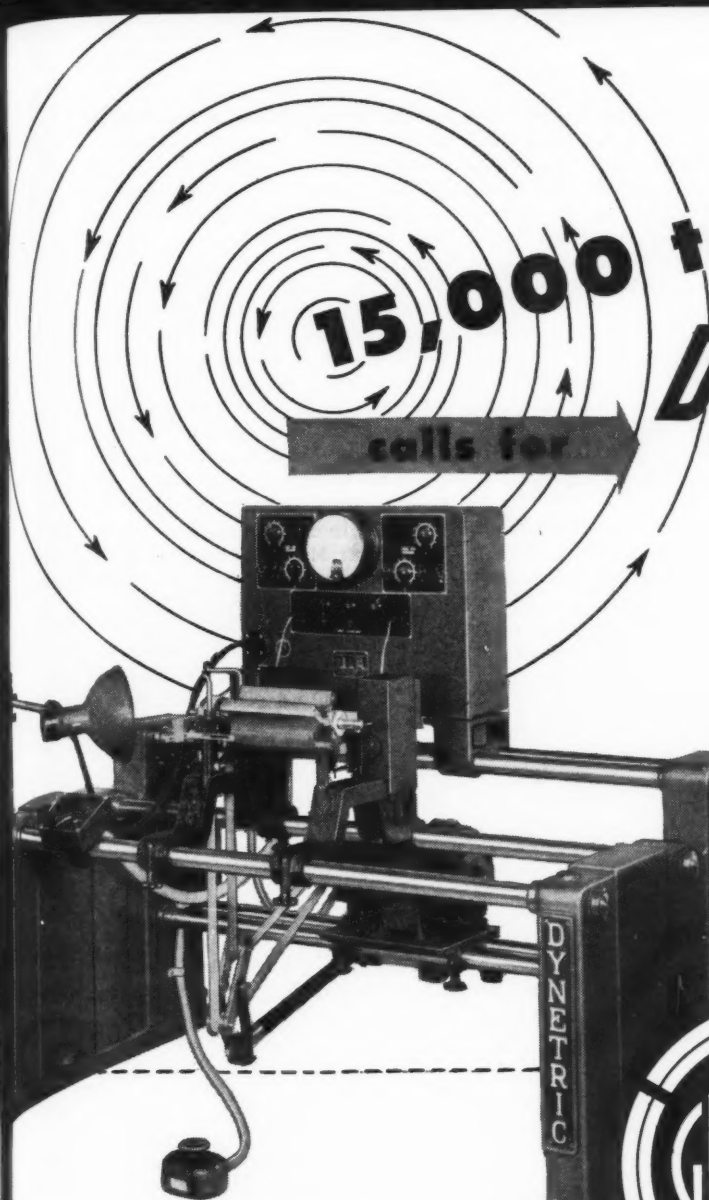
CARL O. ERICKE has been appointed Detroit district manager of the Carpenter Steel Co., Reading, Pa. He has been connected with the company since July, 1934, as sales engineer.

MAX RIEBENACK III has been elected vice-president in charge of sales of the Industrial Brownhoist Corporation, Bay City, Mich., succeeding JAMES B. HAYDEN, who has retired.

New Jersey and Delaware

CLEVELAND-TUNGSTEN, INC., Cleveland, Ohio, a subsidiary of the Molybdenum Corporation of America, has purchased the GENERAL TUNGSTEN MFG. Co., INC., Union City, N. J., and will continue to manufacture all types of tungsten and other electrical contacts at the Union City plant. N. H. COSTAN, vice-president is in charge of operations.

MARCEL C. BOSS, formerly of the engineering staff of the Hanson-Van Winkle-Munning Co., and the Optimus Equipment Co., has formed his own organization under the name of the MABOR Co., Clark Township, Rahway, N. J. The company will build special machinery and equipment based upon Mr. Boss's patents.



15,000 to 20,000 R.P.M. *Dynetric** **Balancing**

Here's another example of the way Dynetric balancing solves an operational and a maintenance problem at the same time.

These two photos show the mating members of a Diesel engine supercharger. Operating at terrific speeds as high as 15,000 to 20,000 r.p.m., even the slightest unbalance would cause destructive vibration and impair the efficiency of the unit. Still worse, it would result in bearing overloads and early bearing failure.

Thanks to the Dynetric principle, extremely accurate balance is made possible to eliminate vibration and insure long, trouble-free operation.

There are practically no limits to the size and weight of parts that can be handled—or to the degree of accuracy obtainable—with Dynetric balancing machines. If vibration, caused by unbalance in rotating parts, is one of your problems, Dynetric balancing will solve it quickly and at low cost. Write us.

**Developed jointly with the Westinghouse Electric Corporation*

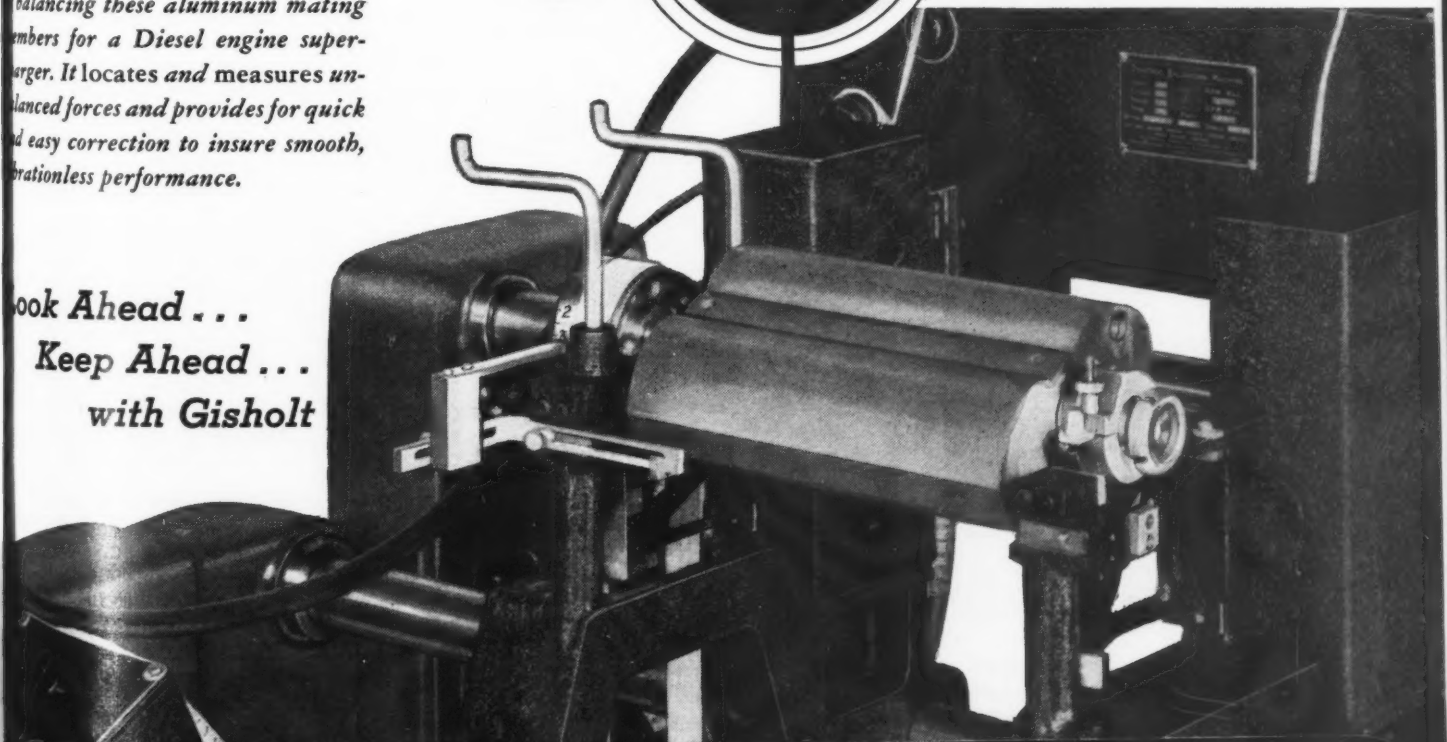
The Gisholt 3S Dynetric is used balancing these aluminum mating members for a Diesel engine supercharger. It locates and measures unbalanced forces and provides for quick and easy correction to insure smooth, vibrationless performance.

**Look Ahead . . .
Keep Ahead . . .
with Gisholt**



GISHOLT MACHINE COMPANY

1209 E. Washington Avenue
Madison 3, Wisconsin



TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

GEORGE M. PEARSE Co., 965 Broad St., Newark 2, N. J., has been appointed sales representative in the metropolitan New York and Newark territory for the JOHN S. BARNES CORPORATION, Rockford, Ill.

DR. RUFUS E. ZIMMERMAN has been chosen to receive the medal of the American Society for Metals for the Advancement of Research for 1946. Dr. Zimmerman is vice-president in charge of research and technology of the United States Steel Corporation of Delaware. The medal will be awarded at the annual dinner of the American Society for Metals to be held in Atlantic City, N. J., on November 21, during the National Metal Congress and Exposition.

New York

A. C. BROWN, JR., has been appointed manager of the Cleveland district office of the Air Reduction Sales Co., New York. Mr. Brown started with the Air Reduction organization in 1935, but spent nearly five years in the Army, where he rose from private to captain. He succeeds STEPHEN H. NEWBURN, who has been appointed Detroit district manager. Mr. Newburn has been with Air Reduction since 1936.

ROBERT W. WARD has been elected vice-president of the American Car & Foundry Co., 30 Church St., New York, N. Y., and has been placed in charge of manufacturing. Mr. Ward was formerly district manager of the organization's Huntington, W. Va., plant. W. E. LUNGER, general superintendent of the Huntington plant has been appointed district manager of that plant, succeeding Mr. Ward.

N. A. LEYDS has been elected president of the newly formed LINDETEVES MA-

CHINE TOOL EXPORT CORPORATION, with offices at 10 Rockefeller Plaza, New York City. The corporation also maintains offices in Amsterdam, Holland, and in the Netherlands East Indies. Mr. Leyds was associated for nine years with R. S. Stokvis en Zonen as manager of that organization's technical department.

CRUCIBLE STEEL COMPANY OF AMERICA, 405 Lexington Ave., New York 17, N. Y., announces that the Syracuse branch of the company has moved its offices and facilities to the Larned Bldg., 114 S. Warren St., Syracuse 2, N. Y. E. C. O'CONNOR is manager of the office.

T. F. DENORMANDIE has been made branch manager of the Buffalo, N. Y., office of the Jessop Steel Co., Washington, Pa., with offices at 1015 Liberty Bank Bldg., Buffalo. He has been associated with the Jessop organization for the last ten years.

K. P. SWANSON has been appointed representative of the PROGRESSIVE WELDER Co., Detroit, Mich., in eastern Connecticut, eastern Massachusetts, Rhode Island, Maine, Vermont, and New Hampshire. His office will be at 15 Gramercy Park, New York 3, N. Y.

G. J. DEKKER has been elected a vice-president of the Ohio Chemical & Mfg. Co., a subsidiary of the Air Reduction Sales Co. of New York. Mr. Dekker has been affiliated with the Air Reduction organization since 1919.

Ohio

CLEVELAND TAPPING MACHINE Co., now located at 3610 Superior Ave., Cleveland, Ohio, has started construction of a new plant at Hartville, a suburb of Canton, Ohio. The plans call for a building that will enable the company to double its

production, while the site permits further expansion in the future. W. R. HARRISON was recently elected president of the company; MARK GRAVES, vice-president; W. E. HAMAKER, secretary and treasurer; and A. R. WISE, factory manager.

RELIAANCE ELECTRIC & ENGINEERING Co., 1088 Ivanhoe Road, Cleveland, Ohio, is establishing a new branch office at Appleton, Wis., with GEORGE E. LAW in charge. M. J. SANDLING will be head of a new office to be opened in Grand Rapids, Mich. WILLIAM K. SCHLOTTERBECK, recently released from the armed services, rejoins the Philadelphia office as sales engineer. E. H. KOONTZ, formerly located in Minneapolis, has been transferred to the company's New York office.

LESTER A. LANNING was recently appointed manager of the Sandusky, Ohio, plant of the New Departure Division of General Motors Corporation. He has been connected with the main plant of the organization at Bristol, Conn., for twenty-seven years. Mr. Lanning started as research metallurgist, and has successively held the positions of chief chemist, metallurgist, and chief metallurgist. In 1939, he became assistant manager of the Bristol, Conn., plant.

BARIUM STEEL & FORGE, INC., Canton, Ohio, has appointed the following sales representatives: W. H. SPOONER and NORMAN KELSEY for the metropolitan New York area, with offices at 25 Broadway, New York City; HALPIN D. BURKE for the St. Louis area, with offices at 407 Security Bldg., St. Louis, Mo.; and STEEL & MACHINE TOOL SALES Co., for the Houston, Tex., area (address P.O. Box 1716, Houston Tex.).

CHARLES E. WILLET has been made sales manager of Burton-Rodgers, Inc., Cincinnati, Ohio, a firm specializing in developing convention exhibits and sales displays for the machine tool and metal trades industry. The firm has also divisions devoted to product design and development, Lumitile lighting, and visual education devices for employee instruction and sales demonstration use.

GENERAL ELECTRIC Co. has placed in initial production part of its \$5,000,000 plastics laminating plant at Coshocton, Ohio. The new plant will replace the present General Electric facilities for the manufacture of laminated materials at Lynn, Mass. When completed, it will consist of three buildings, comprising approximately 235,000 square feet of floor space.

J. E. MURPHY has been appointed manager of distributor sales for the Parker Appliance Co., Cleveland, Ohio. He joined the Parker organization in 1943 as a sales representative in the Dallas, Tex., territory. D. A. CAMERON has been appointed assistant general sales manager of the Parker Appliance Co. He came with the Parker organization in 1941.



W. R. Harrison, Newly Elected President of the Cleveland Tapping Machine Co.



A. R. Wise, Recently Appointed Factory Manager of Cleveland Tapping Machine Co.

*"3 times faster
to find
and drive"*



PITNEY-BOWES tells
independent investigator:

"That's just the time-saving we can measure," explained Pitney-Bowes' production manager to the James O. Peck Co. investigator, who is studying assembly savings with Phillips Screws in well-known plants. "Since using Phillips Screws on our postage meters, we have found that the time savings we *can't* measure exactly are even larger."



"NO TIME WASTED STARTING THE SCREW . . . the Phillips Screw doesn't wobble and slip off the driver. The operator uses his left hand only to start the screw. He can drive it up tight without wasting time. With a slotted screw, he'd have to ease it home more slowly to avoid burring the head. And, we can't risk mail-tearing burrs on screws that secure the polished mail feed plate and mail stacking assembly.

"TAKES LESS TIME TO BREAK IN NEW OPERATORS. Anyone can learn faster to drive Phillips Screws than slotted screws. The Phillips driver automatically aligns itself with the screw and holds its position as the hand shifts, while the conventional driver is apt to slip out of a slotted head screw.

"DRIVER SLIPS USED TO COST US ONE MAN-HOUR PER SLIP . . . before we changed to Phillips Screws. When a driver marred one of the satin-finished, nickel-plated pieces which guide the mail in these machines, the part had to be removed, pickled, refinished, and replated. That took about one man-hour . . . not to mention time lost through interruption of production line momentum."

GET PITNEY-BOWES REPORT AND OTHERS. Available to you now are nine independently made studies of assembly practice in famous plants, making metal, wood, and plastic products. A mine of ideas for cutting costs and ending trouble. **FREE**, of course. Use the coupon **TODAY**.

PHILLIPS *Recessed Head* SCREWS

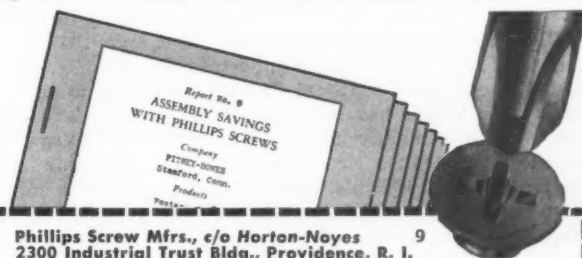
Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

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Atlantic Screw Works
Atlas Bolt & Screw Co.
Central Screw Co.
Chandler Products Corp.
Continental Screw Co.
Cerin Screw Div. of
American Hdwe. Corp.
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International Screw Co.
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26 SOURCES

Manufacturers Screw Products
Milford Rivet and Machine Co.
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New England Screw Co.
Parker-Kalon Corporation

Pawtucket Screw Co.
Pheoli Manufacturing Co.
Reading Screw Co.
Russell Burdall & Ward
Bolt & Nut Co.
Scovill Manufacturing Co.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Wolverine Bolt Company



Phillips Screw Mfrs., c/o Horton-Noyes
2300 Industrial Trust Bldg., Providence, R. I.

Send me reports on Assembly Savings with Phillips Screws.

Name.....

Company.....

Address.....



John E. Lynch, Manager of the New York Office of Cincinnati Milling and Grinding Machines, Inc.

JOHN E. LYNCH, for fourteen years manager of the Cincinnati sales office of Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio, was recently made manager of the New York office of the organization. **CARL M. BEACH** has been made manager of the Detroit office; **E. F. RENDER** has been moved from the Syracuse to the Detroit office; and **W. KENT MATHIAS** has been transferred from the factory in Cincinnati to the Syracuse office.

OHIO CRANKSHAFT Co., Cleveland, Ohio, is reorganizing its Tocco Induction Heating Division and adding a commercial engineering department under the direction of **HARRY L. KELLER**. Mr. Keller has been in charge of engineering standards of the Buick Motor Co., and has been connected with the Buick organization for twenty-five years.

WILLIAM RODDER has been made director of engineering of the Aetna-Standard Engineering Co., Youngstown, Ohio, with which organization he has been connected for seventeen years—for the last eight years as chief engineer. **PERRY SNYDER**, who was formerly with the Youngstown Sheet & Tube Co., succeeds Mr. Rodder as chief engineer.

C. H. WELCH has been appointed plant manager and **J. E. GICKLER** superintendent of the Alloy Cast Steel Co., Marion, Ohio. Mr. Welch has been superintendent of the company since 1928. Mr. Gickler, who takes over the post left vacant by Mr. Welch's promotion, has been assistant superintendent of the company since 1942.

R. E. WAGENHALS, formerly quality control engineer of the Timken Roller Bearing Co., Canton, Ohio, has been appointed director of quality control for all the bearing divisions of the company. He has been with the Timken organization since 1943.



Carl M. Beach, New Manager of the Detroit Office of Cincinnati Milling and Grinding Machines, Inc.

SHERMAN R. LYLE has been made district sales engineer for the Cleveland district of the Steel and Tube Division, Timken Roller Bearing Co., Canton, Ohio. **WILLIAM EARLE BRYDEN** has been made sales engineer for the Chicago district, and **ALFRED J. KINNUCAN** sales engineer for the New York district.

CLARE R. METCALF has been made secretary of the Oster Mfg. Co., Cleveland, Ohio. Mr. Metcalf started with the company as an office clerk in 1912, and has since held various positions, including those of office and credit manager and assistant sales manager.

FORKER CORPORATION, manufacturer of Ohio tramrail systems, Cleveland, Ohio, has purchased a new factory at 2044 Random Road, Cleveland, as part of its expansion program.

DILLEY MFG. Co., maker of magnetic grip-shields, has moved into larger quarters at 1656 Ansel Road, Cleveland 6, Ohio.

Pennsylvania

DR. EDGAR C. BAIN has been awarded the Albert Sauveur Achievement Award for 1946 by the American Society for Metals. Dr. Bain is vice-president in charge of metallurgy and research at the Carnegie-Illinois Steel Corporation, Pittsburgh, Pa. The formal award will be made November 21 at the annual meeting of the American Society for Metals, to be held in conjunction with the National Metal Congress and Exposition at Atlantic City, N. J.

GEORGE O. HENDEE, 404 Mill Road, Havertown, Pa., has been appointed sales engineer for the Hannifin Mfg. Co., Chicago, Ill., manufacturer of pneumatic and hydraulic production equipment, in the Philadelphia terri-

tory, which includes southern New Jersey, eastern Pennsylvania, and Delaware.

VOSS MACHINERY Co., 2382 W. Liberty Ave., Pittsburgh, Pa., has been appointed distributor for the **FERRACUTE MACHINE Co.**, Bridgeton, N. J., and will sell and service Ferracut cutting, forming, and punch presses in western Pennsylvania, West Virginia, eastern Ohio, and western Maryland.

H. K. PORTER Co., Inc., Pittsburgh 22, Pa., has purchased the **AMERICAN SPIRAL SPRING & MFG. Co. of Pittsburgh**. This company, together with the present Porter-owned Fort Pitt spring plant, will be operated as the **AMERICAN FORT PITT SPRING DIVISION OF THE H. K. PORTER Co., Inc.**

ROBINS CONVEYORS, Inc., Passaic, N. J., manufacturer of materials-handling machinery, has consolidated its Philadelphia office, formerly at 12 S. 12th St., with that of the parent organization, **Hewitt-Robins, Inc.**, at 401 N. Broad St., Philadelphia 8, Pa.

EMIL KERN has been made chief engineer of the Allegheny Ludlum Steel Corporation with headquarters at Brackenridge, Pa. Before going to the Allegheny Ludlum organization he was with the Reynolds Metals Co. as chief mechanical engineer.

KEYSTONE ABRASIVE WHEEL, Inc., Carnegie, Pa., has recently opened offices at 1500 Walnut St., Philadelphia, Pa., with **B. L. SCHAEFER** in charge; and in the Guardian Bldg., Detroit, Mich., with **EDWARD B. CAULKINS, JR.**, in charge.

P. D. SCOTT has been appointed general sales manager of the Alloy Rods Co., York, Pa., manufacturer of stainless and alloy welding electrodes. Mr. Scott was formerly associated with the Welding Equipment & Supply Co., De-



P. D. Scott, Newly Appointed General Sales Manager of the Alloy Rods Co.

Announcing "BROACHING"

176 pages
Over 300 illustrations



Covering such subjects as:


Principles of broaching . . . Broach Design . . . Getting the Most Out of Your Broaches . . . When to Use Broaching . . . "Broaching at Work" on large parts and small, internal and surface broaching, large runs and short runs . . . Broach types; specifications . . . Selecting broach length . . . Spline broaching . . . Broaching machines . . . Fixtures for Broaching . . . Pullers . . . Broach gages . . . Broach handling and sharpening.

In preparation for over two years. Designed to be the most complete manual and catalog on broaching and broaching equipment available.

Limited distribution. In requesting a copy, please do so on your company letterhead.

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DETROIT 13, U.S.A.

Broaches  Broaching Machines - Broaching Equipment

MACHINERY, September, 1946—229

troit, Mich., as sales engineer. He became manager of the Tool Steel Electrode Division of the Alloy Rods Co., on January 1 of this year.

PEM W. TAYLOR has been appointed sales representative of the TITAN METAL MFG. Co., Bellefonte, Pa., for North and South Carolina, Georgia, Florida, and Alabama, with offices at 89 Montgomery Ferry Drive, N.E., Atlanta, Ga.

Texas

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York 5, N. Y., announces the opening of the Texas technical section of its Development and Research Division, located in the Bankers Mortgage Bldg., Houston, Tex. This office will furnish to industry technical information and assistance relating to alloys containing nickel. R. J. RICE, metallurgical and chemical engineer, will be in charge.

WALTER E. BELCHER, 3439 Westminster St., Dallas, Tex., since 1921 manager of the Dallas district for the New York Belting & Packing Co., Passaic, N. J., has retired after fifty-one years' service with the company. He began his career as an office boy and subsequently became a salesman. He will be succeeded by J. E. CONAWAY, who has been an assistant to Mr. Belcher.

DAVID C. CROWLEY, 531 Esperson Bldg., Houston 2, Tex., has been appointed representative for the COLONIAL BROACH CO. and COLONIAL BUSHINGS, INC., Detroit, Mich.

Wisconsin and Minnesota

WALTER E. SCHUTZ, advertising and sales promotion manager of the Delta Mfg. Division of the Rockwell Mfg. Co.,



Walter E. Schutz, New President of the Milwaukee Association of Industrial Advertisers

Milwaukee, Wis., has been elected president of the Milwaukee Association of Industrial Advertisers. It is planned to hold the 1947 Silver Jubilee Convention of the National Industrial Advertising Association in Milwaukee, June 16 to 19.

R. E. THOMAS has been appointed purchasing agent for the Dumore Co., Racine, Wis. He was for two years chief accountant of the company, and previous to that was secretary-treasurer of the Indianapolis Brass & Aluminum Foundry. Mr. Thomas succeeds G. K. TOLAKSEN, who has resigned to go into business for himself.

A. F. HASTY has been appointed sales manager in charge of the Simplex Machine Tools Division of the Stokerunit Corporation, 4548 W. Mitchell St., Milwaukee, Wis. Mr. Hasty will handle precision boring, planer type milling, and special machine sales.

HENRY A. MULLEN has been appointed manager of resistance welding sales of Ampco Metal, Inc., Milwaukee, Wis. He was formerly resistance welding field engineer with the company, having headquarters in Detroit.

INDEPENDENT PNEUMATIC TOOL CO., Chicago, Ill., manufacturer of Thor portable pneumatic and electric tools, has opened a new branch sales office at 220 W. Seventh St., St. Paul, Minn., under the management of JOSEPH A. BELL, who, for the last six years, has been the company's sales representative in that area. The new office will serve Minnesota, the eastern portions of North and South Dakota, the northwest portion of Wisconsin, and the upper peninsula of Michigan.

* * *

Iron Powder Plant to be Operated by Continental Machines, Inc.

A plant for the conversion of iron carbonate slate to pure iron powder is being built by the state of Minnesota on the Mesabi Iron Range of northern Minnesota. It is estimated that the new plant will have a capacity of five tons of iron powder per day, with a purity of over 99 per cent. The plant is being built by state funds obtained from the tax on mining iron ore.

Continental Machines, Inc., Minneapolis, Minn., manufacturer of DoAll machine tools, gages, and presses, has contracted to operate the plant. The process to be used has already been proved in the laboratory to be a highly satisfactory means for producing iron powder. It has not yet been operated on a scale large enough to determine commercial production rates and operating costs, but those familiar with the project are confident that the process can yield a pure iron product at a cost that will result in the expanded use of iron powder.

Obituaries



Dwight C. Warren

Dwight C. Warren, New England manager of *The Iron Age*, died suddenly on August 2 in the Hartford Hospital, Hartford, Conn., after a brief illness. He had been associated with *The Iron Age* as New England manager since 1910, when he went to that publication from *The Iron Trade Review* and *The Foundry*, in Cleveland.

Mr. Warren started selling advertising as a very young man, traveling in the British Isles, Belgium, France, and the United States. He was widely known in advertising circles, and was active in the Western New England Chapter of the National Industrial Advertisers Association, of which he was a charter member, serving two terms as a director. He is survived by his widow and a daughter, Mrs. John Sloane.

Harry H. Asbridge

Harry H. Asbridge, a director of the Churchill Machine Tool Co., Ltd., Manchester, England, died recently at the age of seventy-two years. He was recognized as an authority in the highly specialized field of precision grinding and in the design of machines of all types for grinding purposes. For forty years he devoted himself to that branch of the industry.

Mr. Asbridge was born at Gorton, Manchester. He served his apprenticeship—in those days one of seven years—with the well-known machine tool builders Hulse & Co., Ltd. While still a young man, he became works manager of the Manchester Works of Charles Churchill & Co., Ltd., the first products of which were vertical grinding machines and wet tool grinders. Mr. Asbridge played an important part in the design and building of these machines.

The Churchill Machine Tool Co., Ltd., was formed in 1906, and it was at that



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THE WHITING STAMPING TRIMMER

Quickwork stamping trimmers trim, form, and bead complicated stampings in a matter of seconds—and do it accurately. Eliminating the need for expensive trimming dies and saving valuable press time, they cut production costs and speed output as well.

Handling almost any type of stamping in a single plane, Quickwork trimmers trim steel, stainless steel, and aluminum alloy stampings, with

or without flash, with equal ease. Jigs or fixtures are especially adapted to the job, guiding even the most intricate stampings throughout the entire pass.

Check the possibilities of a Quickwork for solving your stamping trimming problems; write for Bulletin QW-119.

WHITING CORPORATION

15673 LATHROP AVENUE, HARVEY, ILLINOIS

Export Department: 30 Church St.
New York 7, N. Y.

time that Mr. Asbridge began his real life work by designing a 6- by 34-inch plain grinding machine of the precision type. Ever since that time he had been actively engaged in this field.

Mr. Asbridge was a member of the Institution of Mechanical Engineers. He was also a member of the Manchester Association of Engineers, serving as president in 1944-1945.

Ellsworth Marshall Rust

Ellsworth Marshall Rust, vice-president of the Rust Engineering Co., Pittsburgh, Pa., died at his home in Leesburg, Va., on July 24, at the age of sixty-seven years. Mr. Rust received his education at the Virginia Military Institute. In 1905, he founded, with his brothers—E. J. Lee Rust and S. Murray Rust—the Rust Engineering Co. of Pittsburgh, Pa., Birmingham, Ala., Washington, D. C., and New York, and had been continuously connected with the company as vice-president ever since. He was also vice-president of the Rust Furnace Co., Pittsburgh, Pa., and the Boliver Clay Products Co., Boliver, Ohio; and president of the Woodbridge Clay Products Co., Woodbridge, Va. He was treasurer of the Associated General Contractors of America for many years.

A. E. LINDBERG, who was associated with the Moline Tool Co., Moline, Ill., from 1910 until his retirement in 1944, died on July 17. He became chief engineer of the company in 1919 and retained that position until his failing health made it necessary for him to retire. Through his devotion to his work, his loyalty, and his ability to get along well with all with whom he came in contact, he made many friends both for himself, for the company with which he was connected, and for the machine tool industry in general.

FRANK A. TERRY, for twenty-seven years branch manager at Cincinnati, Ohio, for the Columbia Tool Steel Co., Chicago Heights, Ill., died recently at Brownsville, Tex. Mr. Terry retired in 1939 due to ill health.

* * *

Long Service Records at Ryerson

Thirty-four employees with an average of over thirty-two years of service with Joseph T. Ryerson & Son, Inc., Chicago, Ill., retired early this year. The oldest employee in length of service is William H. Basse, who started with the company in November, 1900, as an office boy, and who in the last forty-six years rose to a position of importance in the sales division. Another long service record is that of Ernest L. Hartig, who started in the bookkeeping department forty-four years ago and who became vice-president in 1920. He will continue as a member of the board of directors.

Coming Events

SEPTEMBER 11-12 — National Tractor Meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Hotel Schroeder, Milwaukee, Wis. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

SEPTEMBER 12-14 — Twenty-third annual convention of the NATIONAL ASSOCIATION OF FOREMEN at the Forest Park Hotel in St. Louis, Mo. Further information can be obtained from the convention headquarters in St. Louis or from the national office of the Association, located at 11 W. Monument Bldg., Dayton 2, Ohio.

SEPTEMBER 16-20 — 1946 Exhibit and conference of the INSTRUMENT SOCIETY OF AMERICA at the William Penn Hotel in Pittsburgh, Pa. Richard Rimbach, executive secretary, 1117 Wolfendale St., Pittsburgh 12, Pa.

SEPTEMBER 18-19—Fall meeting of the AMERICAN MACHINE TOOL DISTRIBUTORS' ASSOCIATION at the Homestead, Hot Springs, Va. Executive secretary, Thomas A. Fernley, Jr., 505 Arch St., Philadelphia 6, Pa.

SEPTEMBER 30-OCTOBER 3 — Fall meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Boston, Mass. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

OCTOBER 3-5—Aeronautic Meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Biltmore Hotel, Los Angeles, Calif. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York 18, N. Y.

OCTOBER 3-5 — NATIONAL ELECTRONICS CONFERENCE at the Edgewater Beach Hotel, Chicago, Ill. For further information, address E. H. Schulz, secretary, National Electronics Conference, Technology Center, Chicago 16, Ill.

OCTOBER 10-12 — Semi-annual meeting of the AMERICAN SOCIETY OF TOOL ENGINEERS at the William Penn Hotel, Pittsburgh, Pa. H. E. Conrad, executive secretary, 1666 Penobscot Bldg., Detroit 26, Mich.

OCTOBER 15-25 — An intensive ten-day course in QUALITY CONTROL BY STATISTICAL METHODS, at the COLLEGE OF ENGINEERING, UNIVERSITY OF IOWA, Iowa City, Iowa. For further information, address Professor Earle L. Waterman at the University of Iowa.

OCTOBER 16-17 — National Transportation and Maintenance Meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Hotel Knickerbocker, Chicago, Ill. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

OCTOBER 28-30 — Semi-annual meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION at the Edgewater Beach Hotel, Chicago, Ill. Newbold C. Coin, executive secretary, Empire Bldg., Pittsburgh 22, Pa.

NOVEMBER 7-8 — National Fuels and Lubricants Meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Mayo Hotel, Tulsa, Okla. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

NOVEMBER 18-22 — Annual meeting of the AMERICAN WELDING SOCIETY at Atlantic City, N. J., in conjunction with the National Metal Congress and Exposition. Secretary, M. M. Kelly, 33 W. 39th St., New York 18, N. Y.

NOVEMBER 18-22 — NATIONAL METAL CONGRESS AND EXPOSITION in Atlantic City, N. J., under the auspices of the American Society for Metals. For further information, address managing director, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

DECEMBER 2-6—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in New York City. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

DECEMBER 2-7—SEVENTEENTH NATIONAL POWER SHOW at Grand Central Palace, New York. Further information can be obtained from the manager, Charles F. Roth, Grand Central Palace, New York 17, N. Y.

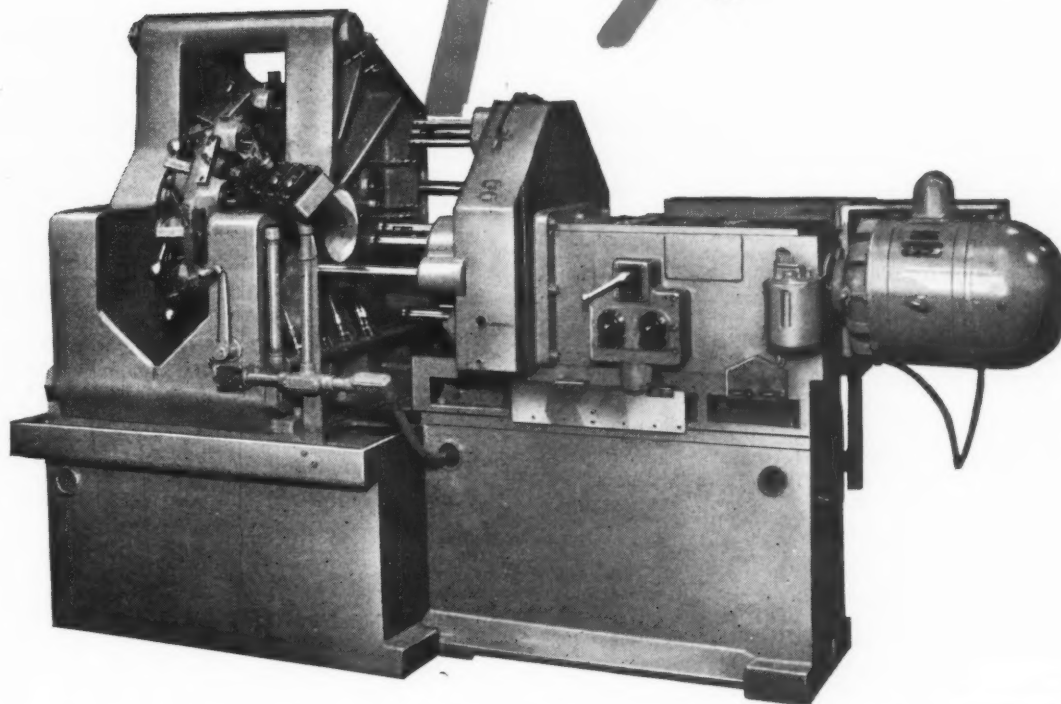
New Books

INSTRUCTION PROGRAMS FOR DOALL MACHINES, TOOLS, AND GAGES. 263 pages, 6 by 9 inches. Profusely illustrated. Published by the DoAll Co., 1301 Washington Ave. South, Minneapolis 4, Minn.

This book is Volume I of a series of instruction programs for DoAll machines, tools, and gages. It covers the technique of contour sawing. While primarily intended for use in educational and vocational institutions, this book will also be found very useful in industry for the instruction of apprentices and learners.

The instruction material covers contour sawing and filing in all its aspects. It is divided into two sections; one covers conventional procedures, and the other high-speed sawing. Work projects to be carried out by the students and tests to determine their skill are included. The material has been four years in preparation, and is substantially the same as has been successfully used by the Army and the Air Corps in training DoAll operators. The book is available free of charge for those requesting it on a company letter-head.

INCREASED PRODUCTIVITY!



You've got Increased Productivity—plus!—when you get high output with economical Baker standard, self-contained units. The steering gear ball nut on NEXT year's car may require a different set of operations, but the Baker machine designed for THIS YEAR'S production can be easily adapted to meet such changes in design. That's a PLUS VALUE added to the immediate advantages of increased productivity with maximum operator convenience and high accuracy.

This machine uses the new Baker 7½AA14 hydraulic unit with a variable delivery pump. A twelve-station rotary trunnion fixture permits loading and unloading while eleven other drilling, end milling and countersinking operations are performed. A pushbutton control station is conveniently located. The head can be readily brought back beyond its normal position for changing tools. And, like all Baker machines, the units are mounted on a well-ribbed, welded steel bed, normalized to insure permanent alignment.

Increased Productivity is the answer to many of today's problems of production, employment and profits. How to get Increased Productivity is a problem that Baker engineers are well equipped to solve. Put your problems up to us.

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SINGLE AND MULTIPLE SPINDLE MACHINES FOR DRILLING, BORING, FACING, TAPPING

Classified Contents of This Number

DESIGN, FIXTURE AND TOOL

- Self-Locking Adjusting Device—*By Michael Goldberg* 179
 Tool for Gaging Pressure Exerted by Broaches on Commutators of Motors—*By Albert M. Thomas*.... 180
 Die Designed to Produce Curled Eye at One End of Steel Strip 181
 Simple Arrangement for Tapping Aluminum Parts.. 181

DESIGN, MACHINE

- Cutting an Increasing Twist in Gun Rifling—*By George Tonn* 176
 Automatic Variable-Lift Cam Mechanism—*By L. Kasper* 178

MANAGEMENT PROBLEMS

- Industry is Asked to Assist Metal Scrap Movement.. 154
 Tools for Scrap or for Training Our Youth?..... 174

MEETINGS AND NEWS OF SOCIETIES

- Meeting of the Industrial Diamond Association..... 171
 Tool Engineers to Hold Semi-Annual Meeting in Pittsburgh 171

NEWS OF INDUSTRY

- Federal Products Corporation Sponsors Quality Control Conferences 157
 Gearing Industry Reports Increase..... 165

- Engineering News 172
 American Locomotive Co. Builds Seventy-Five Thousandth Locomotive 173
 Erik Oberg Retires as Editor of MACHINERY..... 175
 Progress in Gas-Turbine Development..... 212
 News of the Industry..... 223
 Iron Powder Plant to be Operated by Continental Machines, Inc. 230
 Long Service Records at Ryerson..... 232

SHOP PRACTICE

- Hot-Spinning Heavy Tank Heads—*By Charles H. Wick*..... 141
 Grinding Operations on Stellite and Hastelloy Products 148
 How Ford Automobile Bodies are Phosphate-Coated—*By Charles O. Herb*..... 150
 Broaching in Post-War Production—*By O. W. Bonnafé*..... 155
 Modern Flat Surface Grinding Practice—*By J. C. Arndt and W. S. Hollowell*..... 158
 Small Capacity Heat-Treating Furnace for Small Shops and Laboratories..... 165
 Pneumatically Operated Fatigue-Testing Machine.... 171
 Selected Sets of Replacements..... 173
 Aluminum-Alloy Selector 178
 Shop Equipment News 182

WELDING PRACTICE

- Heliarc Welding—A Newly Developed Arc-Welding Process 166

Oil Storage and Handling

Refiners of hydraulic oils take particular care to see that no contaminant of any sort enters the oil up to the time it is delivered. The same care should be exercised after its delivery. Dust, water, lint, and, in fact, contaminants of any kind can seriously impair the action of a hydraulic system. To prevent such material from contaminating the oil, these simple rules should be observed.

1. Store oil drums on their sides and under cover. Water collecting on the top of a drum, if stored outside, may work through the bung seal into the oil.

2. Before opening a drum, wipe the top carefully, so that no dirt can fall into the oil.

3. Inspect and clean all containers into which the oil is being drawn.

4. If oil drawn out of storage is not used immediately, keep it tightly covered.

5. Before adding oil to a hydraulic system, wipe off the filling plug and funnel with clean, lint-free rags.

6. Use strainers when filling reservoirs.

7. Don't forget to close the reservoir tightly.

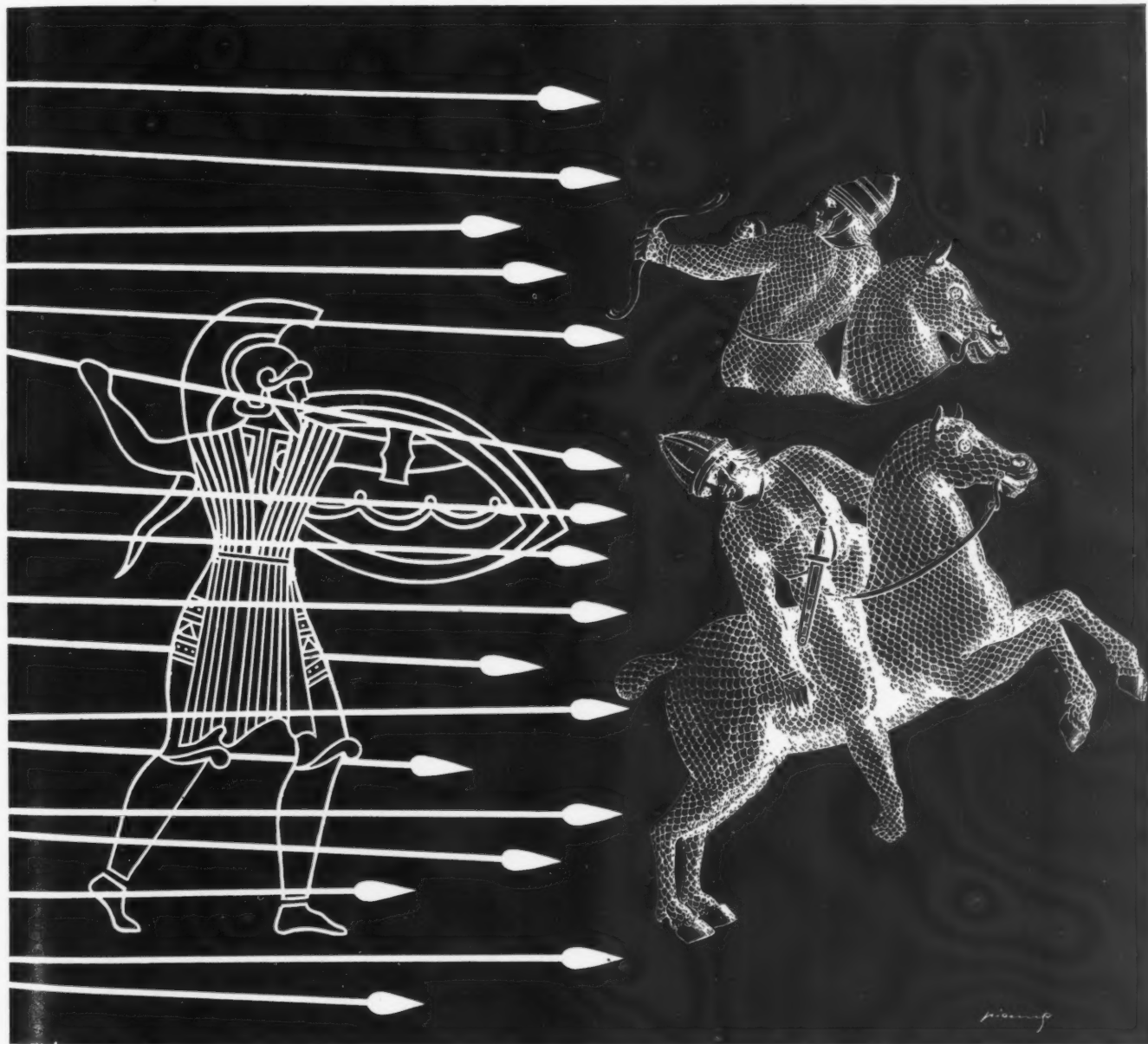
Cleanliness is of paramount importance in hydraulic systems.

Suggestions Made by the Texas Co.,
 New York City

THE MACEDONIAN SURPRISE PARTY

When the proud Persian hordes plunged headlong at Philip of Macedon's army, they were dumped into the minor leagues by an entirely new strategy, the phalanx: a solid wall of warriors sixteen ranks deep. Strength-in-depth withstood and defeated the impact of an over-confident enemy.

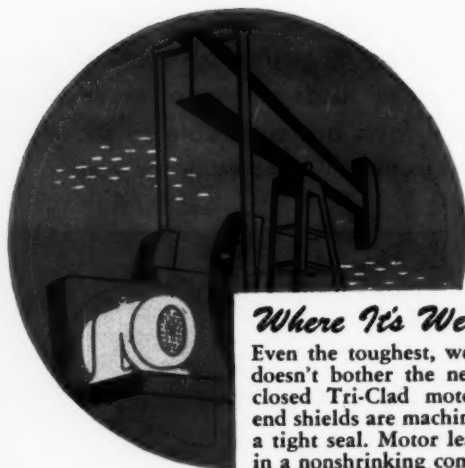
Molybdenum steels are economical means of getting the strength-in-depth called hardenability. With it, you're assured of dependable performance under severe service conditions. Practical facts are available to show you where molybdenum can go to work for you.



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CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

Climax Molybdenum Company
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FOR TODAY'S *Tougher Jobs...*



Where It's Wet

Even the toughest, wettest weather doesn't bother the new totally enclosed Tri-Clad motors. Cast-iron end shields are machined to provide a tight seal. Motor leads are sealed in a nonshrinking compound. Long, close-running fits, and a rotating labyrinth seal, keep moisture from entering the motor along the shaft.



Where It's Corrosive

Acids, alkalis, corrosive fumes, and vapors are kept out of these sturdy new Tri-Clads by tight joints treated with special sealants. Corrosion-resisting screws hold conduit-box covers tightly. Tough Glyptal* paint gives protection from corrosion.



Where It's Dirty

Dirt and dust that cut motor efficiency and shorten motor life can't get into these sealed, totally enclosed Tri-Clad motors. Smooth easy-to-clean surfaces and rounded contours enable these Tri-Clads to look good even in dirty surroundings.



Where Iron Dust Flies

Harmful iron dust and metallic filings can't get past the inner wall of these new Tri-Clads. Bearings are safe from gritty dust in cast-iron housings cast integral with end shields. Long, close-running fits and a rotating labyrinth seal stop dust infiltration along the shaft.



Where Space Is Tight

When space is limited for a totally enclosed motor, you'll appreciate the trim, extra compactness of the new Tri-Clads. A diagonally split conduit box, mounted on either side of the frame, adds little to over-all motor width. These motors do a big job in a little space.



Where Explosion Hazards Exist

The new Tri-Clad totally enclosed motor is available in explosion-proof and dust-explosion-proof constructions with special features that make it suitable for Class I, Group C (through 15 hp) and Group D, and Class II, Groups E, F, and G, locations. All sizes tested and listed by Underwriters' Laboratories, Inc. Also in Bureau of Mines construction (Schedule 2E).

HERE'S A NEW *Tougher Motor*

THE G-E **TRI/CLAD** TOTALLY ENCLOSED MOTOR

1 to 1000 Hp

Enthusiastic reception of the Tri-Clad open motor, with its *extra protection* features, proved that industry was waiting for a motor with protection built in. And, since 1940, more Tri-Clad motors have gone into service than any other integral-horsepower motor.

Now General Electric is ready with a new line of Tri-Clad motors—totally-enclosed, fan-cooled motors—the toughest motors we've ever built.

These new Tri-Clads are designed and built specifically for use in many adverse atmospheres—in iron dust, out of doors, in hazardous areas, and chemical atmospheres. *We believe that they are industry's most dependable motors.*

Their scope of application is as wide as the field of industrial motor use. Safeguarded against most sources of motor damage, their longer life and lower maintenance will make them a sound investment on almost every job.

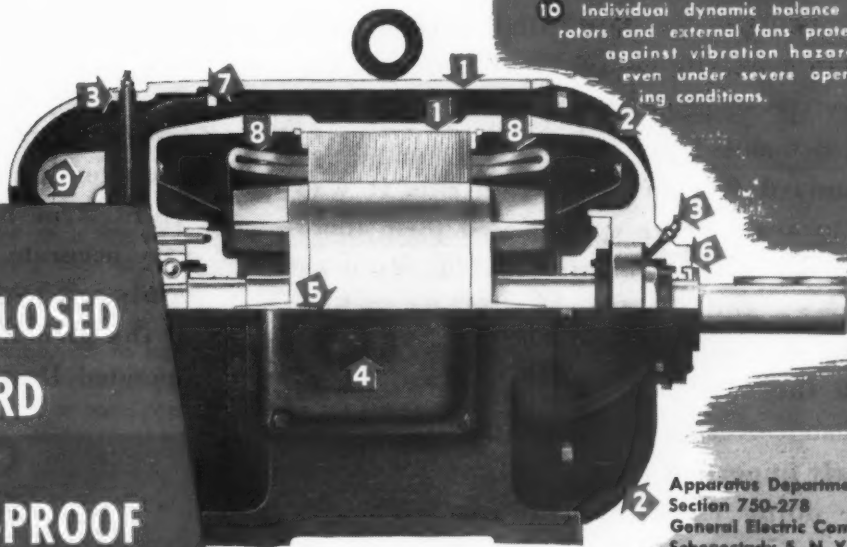
**Trade-mark Reg. U.S. Pat. Off.*

10-POINT PROTECTION

- 1 A cast-iron, double-wall frame completely encloses and protects the windings and punchings.
- 2 Corrosion-resistant cast-iron end shields are machined to provide a tight seal, and protect the motor from dust, dirt, and moisture. Primer and finish coat of protective Glyptal affords high rust-resistance.
- 3 A pressure-relief greasing system, which can be packed with long-life lubricant, protects the bearings.
- 4 The cast-iron conduit box is diagonally split for easy wiring. Boxes are independently explosion-proof on Class I motors.
- 5 Nonshrinking compound around motor leads protects motor interiors from dust and moisture at the point where leads pass through the frame.
- 6 Rotating labyrinth seal further protects motor interior from damage by foreign matter.
- 7 Large air passages provide adequate protection from overheating. Easy to keep clean and open, too.
- 8 Modern, "ageless" insulation treatment includes windings of Formex magnet wire.
- 9 Removable external fan is of the nonsparking type in explosion-proof motors.
- 10 Individual dynamic balance of rotors and external fans protects against vibration hazards, even under severe operating conditions.



**TOTALLY ENCLOSED
STANDARD
and
EXPLOSION-PROOF
MOTORS**



Apparatus Department,
Section 730-278
General Electric Company
Schenectady 5, N. Y.

**FOR THE
COMPLETE STORY**

GENERAL  ELECTRIC
750-278-8030

Please send me GEA-4400, which describes the new Tri-Clad totally enclosed motors. Please send me GEA-4141, "Motors and Control for Hazardous Locations."

NAME _____

COMPANY _____

ADDRESS _____

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

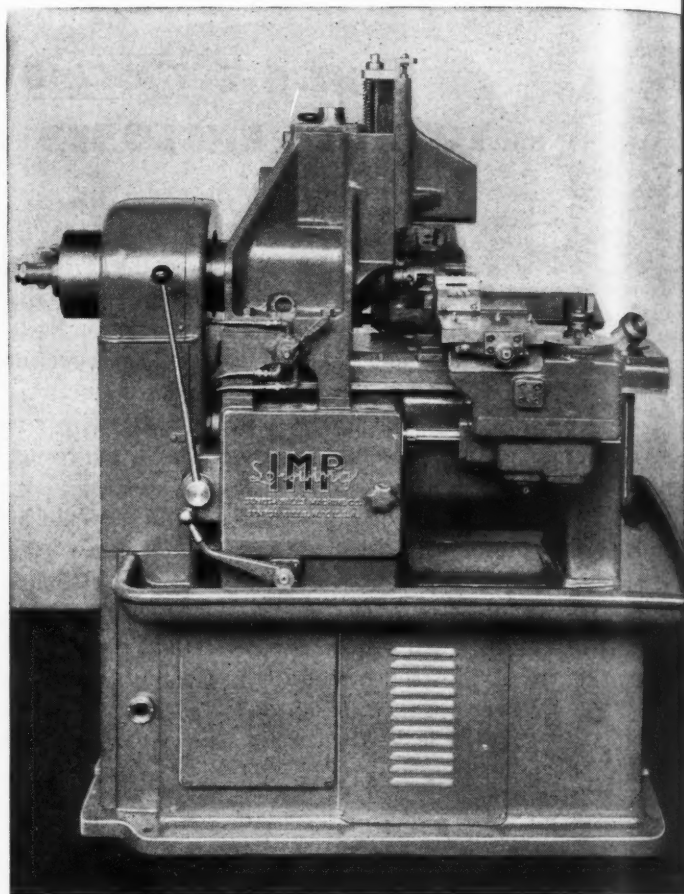
Lo-swing IMP LATHE

meets exacting demands on
**SHOCK ABSORBER
PART JOB**

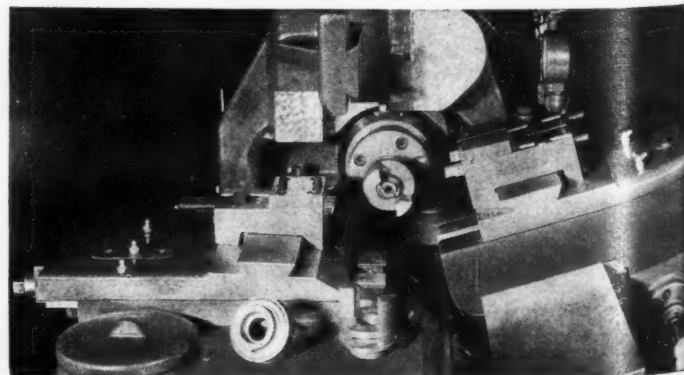
Problem: To finish turn various diameters and shoulders, and face both ends of a shock absorber part ... to maintain a close degree of accuracy in volume production ... to provide machines easily changed-over for other work.

Solution: Two Lo-swing IMP Lathes were selected for this job primarily because they provided the necessary speed, productive capacity and close accuracy demanded. By equipping these IMPs with standard Overhead Third Arms it was possible to avoid using complicated form tools (objectionable when cemented carbide used as in this case), and greatly simplify the tooling setup. The demand for flexibility was admirably met with the IMP'S inbuilt, fully-mechanical Quick Change-over Mechanism. This feature was particularly important to the purchaser... a manufacturer doing extensive contract work, who did not want to charge the machine investment entirely against this particular job.

As mentioned above, Cemented Carbide Tools were used to maintain high productive efficiency on these lathes.



As shown in the illustrations, the Front Carriage carries three tools which turn three diameters on the OD; a single tool on the Third Arm finishes a step on the part to very accurate limits; the Back Attachment, equipped with two tools, faces both ends of the piece. The work is held by an air-operated Draw Bar.



LATHE NEWS from SENECA FALLS

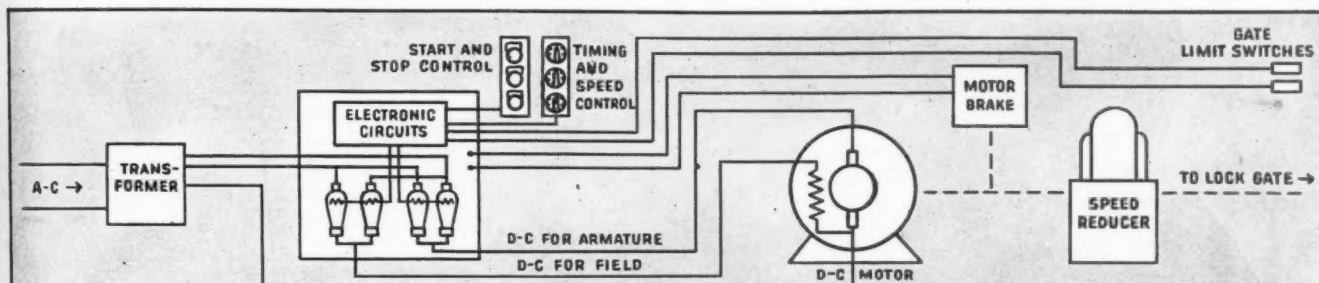
Step-Up machine performance with — AUTOMATIC ELECTRONIC SPEED CHANGING

● You simply preset the desired speed levels and Thy-mo-trol drive does the rest!

Today, machine designers are taking advantage of the adaptability of G-E Thy-mo-trol drive. For example, in getting automatic speed change from one preset level to another, the drive can be used in conjunction with an electric timer so that the change occurs after a definite time. It can be used with limit switches or photoelectric relays so that the change will occur when some moving part reaches a predetermined position. Or, it can be used with a tachometer generator so that the change occurs when some rotating part reaches a certain speed. And—the speed change is made entirely by electrical means through the use of electronic control.



An unusual and interesting application of G-E Thy-mo-trol drive has been made to the lock gates at the mouth of the Chicago river. View above shows the d-c drive motor and the diagram below shows how it works.



Big Lock Gates Opened Electronically. To prevent the lock gates at the head of the Chicago river ship canal from being "cracked" too rapidly, which might cause dangerous water current, a two-speed gate drive is used. Originally, two motors, one high- and one low-speed, were used in a single closing or opening operation. The changeover from high to low speed required a complicated gear arrangement and the constant attention of a trained operator. A G-E Thy-mo-trol drive was installed on one of the four gates and one d-c

motor now does the entire job for this gate. It operates at 70 rpm during the low-speed phase and then automatically accelerates to 1750 rpm for high-speed operation. An operator merely sets a timer at a control station to determine when the gate drive will accelerate to high speed or drop to low speed. The change in speed may also be given by a limit switch on the gate. Fast and slow speeds are preset by two dials, and a third dial sets the time. A second limit switch de-energizes the drive and sets the drive brake.

A VERSATILE TOOL

Automatic speed changing is only one of a variety of jobs in which Thy-mo-trol drive is saving time and improving production techniques. It is now being used on machine tools and production-line equipment—(1) to give stepless speed control over a wide range, (2) to match the speeds of two or more operations, (3) to hold constant speed under changing load, (4) to provide smooth, rapid, constant-current acceleration, and (5) to provide fast stops with dynamic braking. Some of the many applications include:

- milling machines
- propeller-governor testers
- grinders
- magneto testers
- tensile testing machines
- welder-carriage drives
- reel drives
- winch drives
- tool-room lathes
- conveyors

- reversing-table drives
- thread-making machines
- drill presses
- tire-tread machines
- boring mills
- alternator sets
- automatic-screw machine
- pump drives
- superfinishes
- weld positioners

HOW THY-MO-TROL WORKS

A Thy-mo-trol drive system employs electronic rectifying tubes for converting a-c power to d-c power. These "valves" or thyatron tubes supply the power to the drive motor. By properly controlling the grids of these tubes, the current or power is varied, thus effecting highly accurate control of drive-motor speed and torque.

A standard Thy-mo-trol drive consists of four compact units—d-c drive motor, electronic panel, power transformer, and control station. Drives rated $\frac{1}{8}$ to 25 hp are now available. Larger or smaller ratings can be furnished on request. For complete operating details, send for Bulletin GEA-4025.

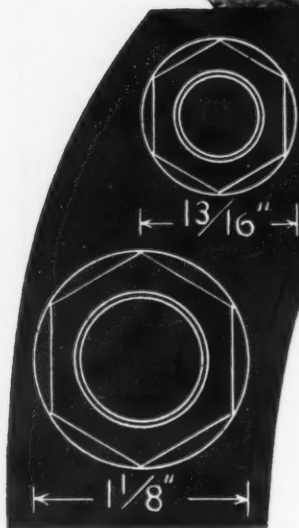
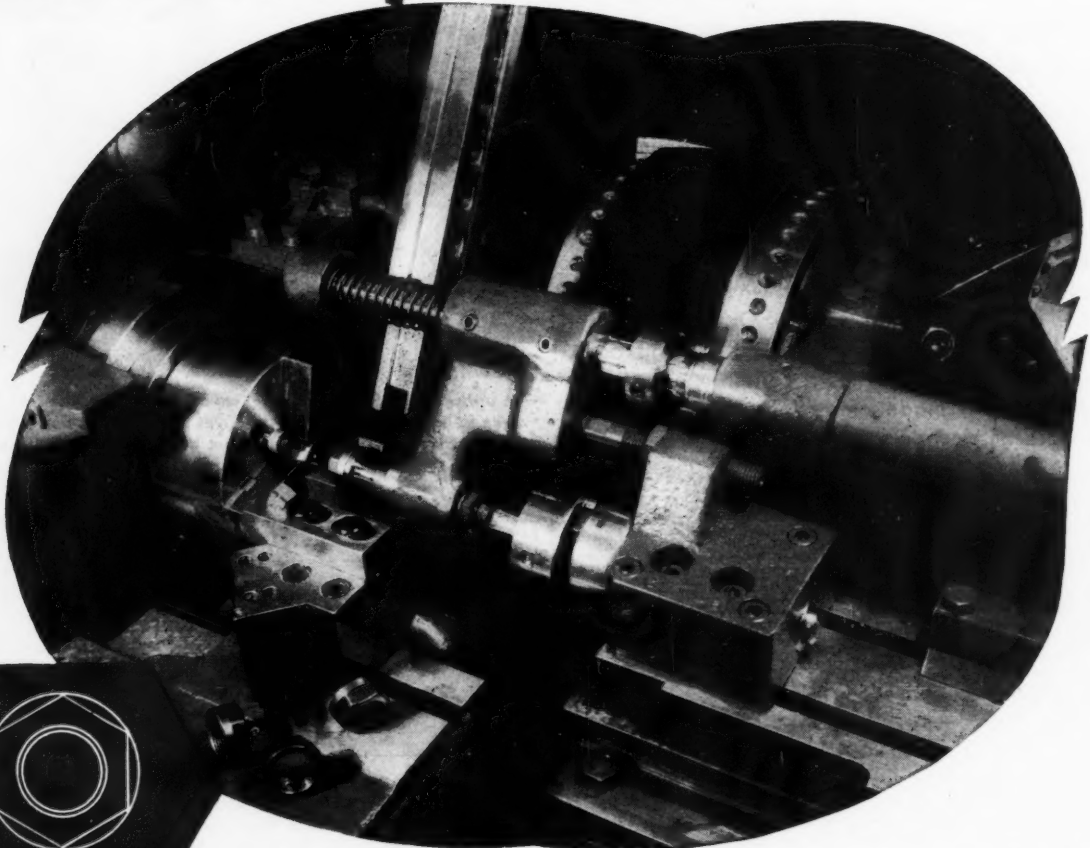
Apparatus Dept., General Electric Co., Schenectady 5, N. Y.

GENERAL ELECTRIC

676-194

**THY-MO-TROL
DRIVE**

High Speed Chucking Operation Automatically Loaded...



ACTUAL SIZE

Above shows largest and smallest of four types of nut blanks processed on this machine. Some are flanged, some plain. Simple changes adapt tools and fixtures. Carbide tools and high speeds and feeds help to deliver up to 135 nuts per hour.

On a CLEVELAND 1½" B

Magicians say . . . "the hand is quicker than the eye" . . . but for chucking finish operations on cast-iron hex nut blanks this set-up on a Cleveland Automatic is quicker than the hand, and more productive. This job is worked with carbide tools at fast spindle speeds and delivers up to 135 nuts per hour.

A bar type magazine carries the cored blanks . . . A cradle actuated by the rear cross-slide advances to center with one blank . . . Conveyor finger on stop gauge fixture, actuated by milling slide forward and return motion, swings down and withdraws blank from cradle, which then pulls back for reload . . . Milling slide approaches chuck, causing conveyor finger to insert blank in rotating jaws . . . Precisely timed air valves, operated from camshaft, close chuck and conveyor withdraws . . . Cross slide turning attachment drills, ID to work size, broadfaces and chamfers ID and OD . . . Milling slide handles tapping and withdrawal at carbide working feed . . . Air operated chuck opens and ejector spring, loaded by insertion of blank, ejects finished nut.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

2263 ASHLAND ROAD • • CLEVELAND 3, OHIO

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CINCINNATI (12) 4932B Beech St.

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PEERLESS ^{HIGH}SPEED REAMERS
 TRADE MARK REG. U.S. PAT. OFF.

...THEY GET MAXIMUM TOUGHNESS AT MINIMUM COST

Good tools help any machinist do a better job... at lower cost. This explains why there is such a steady demand for PEERLESS High Speed Reamers and the many other CLEVELAND Tools of equally high quality—Twist Drills, Screw Extractors, Arbors, Mandrels, Sockets, Mills, Counterbores, and MO-MAX High Speed Ground Tool Bits and Cut-off Blades.



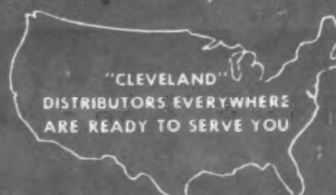
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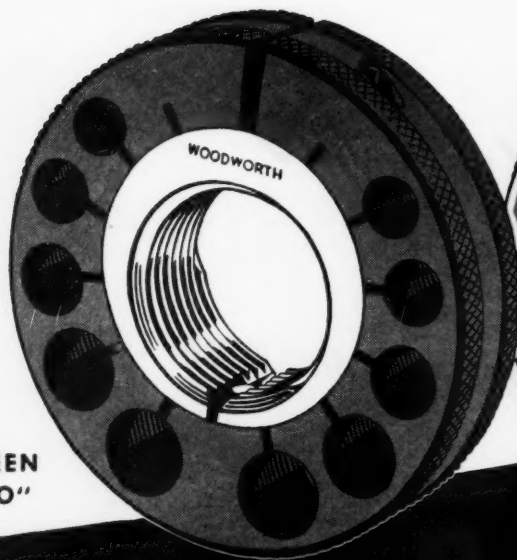
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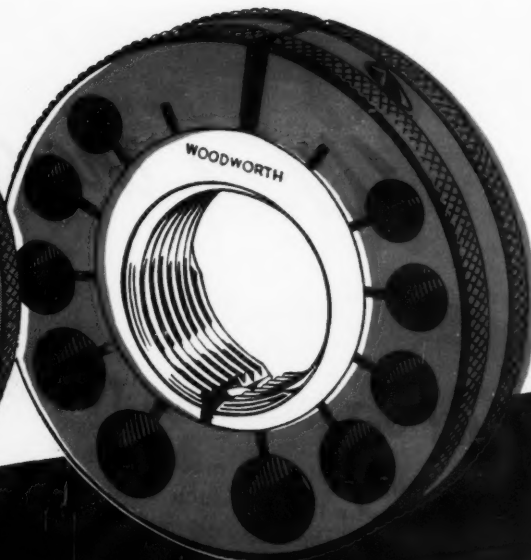
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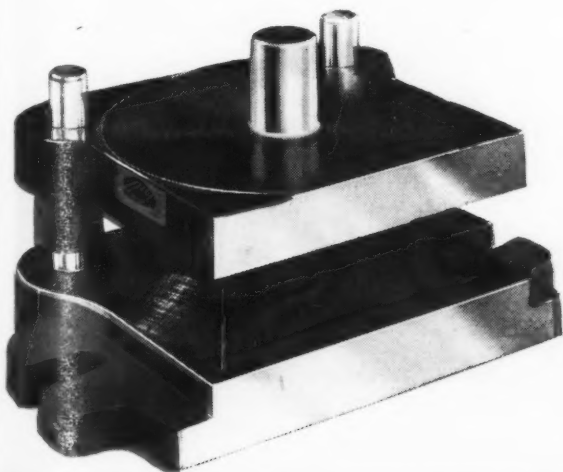
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PAT. OFF.

Super-Hi-Speed Drill Press

A high-speed drill press by Delta-Milwaukee, for greater accuracy on small-hole work from .025" to 1/4" diameter — in plastics, aluminum, and other metals. Drills to the center of a 14" circle.

Embodies all the well-known construction features and operating advantages of other Delta-Milwaukee drill presses. Three-step pulley permits speed range of 12,000 . . . 8000 . . . 5000 R.P.M. Dynamically-balanced motor. Full spindle travel of 2 1/4". Specially-selected Jacobs chuck.

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Send coupon for Bulletin No. A-14-3.



Subsidiary of Rockwell Manufacturing Co.

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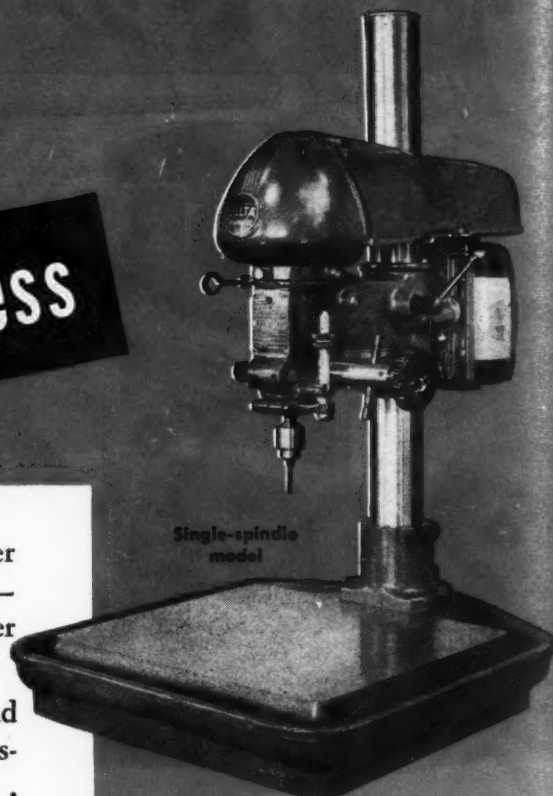
THE DELTA MANUFACTURING CO.
607K E. Vienna Ave., Milwaukee 1, Wis.
Please send me Delta-Milwaukee Super-Hi-Speed Drill Press
Bulletin No. A-14-3 and also bulletins on tools I have checked:

- ☐ Drill Presses
☐ Band Saws
☐ Abrasive Belt
Finishing Machine

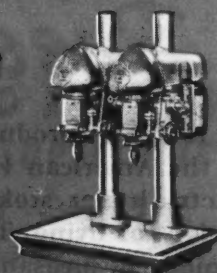
- ☐ Cut-Off Machines
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Company.....
Address..... (.....) State.....
City.....

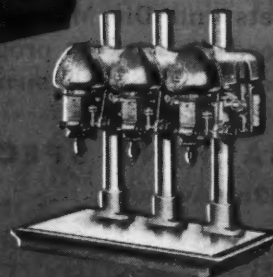
- Single-spindle model — with production table
- 2-spindle, 3-spindle, and 4-spindle models — with sectional tables
- Head, complete with motor, available separately for use on your present 14" drill press columns



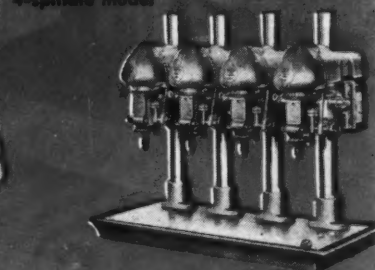
Single-spindle model



2-spindle model

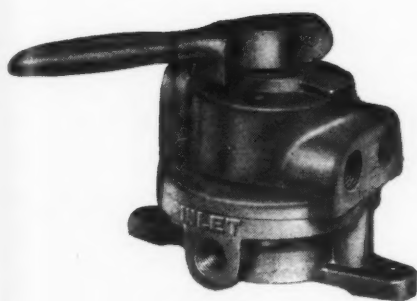


3-spindle model



4-spindle model

*Trade Mark Reg. U. S. Pat. Off.



Hand Valve



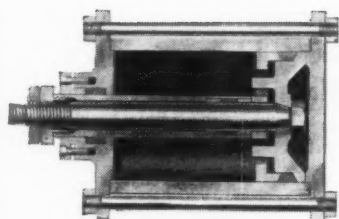
Honed Bore of a 16 in. x 7 ft.
cylinder



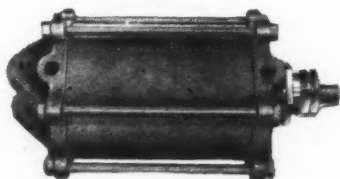
HANNIFIN

CYLINDERS and VALVES

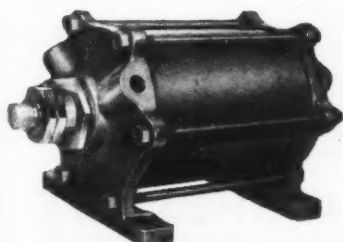
get MORE out of air power



Sectional View



Model BR



Model CR

Hannifin precision air cylinder design provides a high efficiency piston seal that can be easily maintained, thus preventing leakage and waste of air power and keeping friction losses at the minimum. Hannifin cylinders are bored and then honed on special long-stroke honing machines, producing an accurate mirror-finished cylinder interior. The soft, graphite-treated piston packing is easily adjusted from outside the cylinder without disturbing any other parts. The original high-efficiency piston seal is easily maintained for uninterrupted performance and maximum useful work from compressed air supply.

Hannifin cylinders are built in a full range of standard mounting types, sizes 1 to 12 inch diameter, for any length stroke. Special cylinders built to order.

Hannifin Air Control Valves offer a complete selection of hand or foot operated models for control of single or double-acting cylinders. All models are packless disc type for positive control.

HANNIFIN Manufacturing Company

621-631 SOUTH KOLMAR AVENUE • CHICAGO 24, ILLINOIS

MACHINERY, September, 1946—245

RUST PREVENTION

How to Eliminate Stains and Rust in Grinding Operations

EFFECTIVE PRODUCT SAFEGUARDS MACHINED PARTS AFTER REMOVING FINGER STAINS

"In any grinding operation, wet or dry, there is a definite tendency for the metal to be stained with the finger prints by handling, after the operation is completed. In wet grinding operations there is a strong and definite tendency to stain plus formation of a froth of rust.

Lubrication Engineer's Report

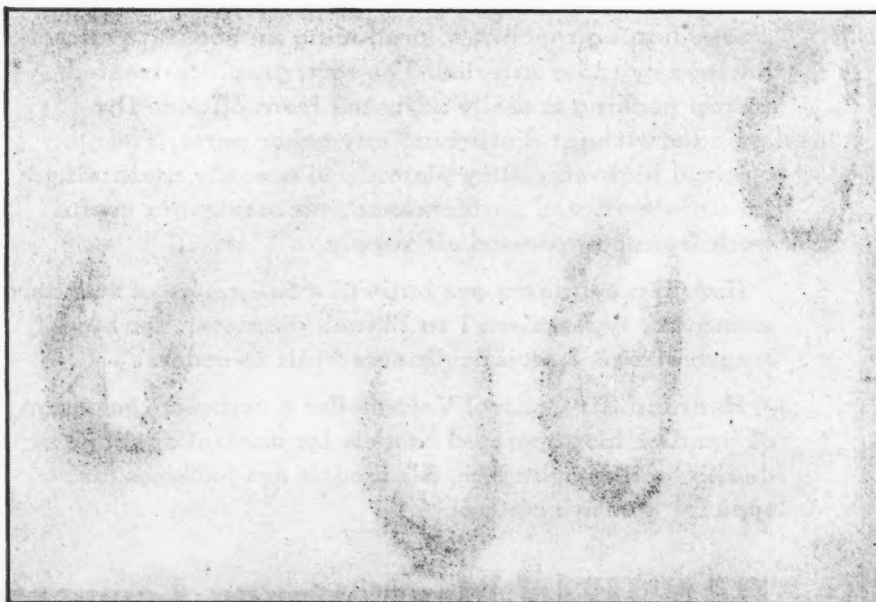
"Atmospheric conditions have frequently caused rusting regardless of the richness of the grinding mixture. To combat this difficulty in the manufacturing operations of two St. Louis concerns*, we recommended the ap-

plication of Cities Service Anti-Corrode No. 148.

"This product has proven very successful in removing finger stains as well as providing a suitable protection against rust until the part is shipped or assembled into a complete unit.

"A very desirable feature of Cities Service Anti-Corrode No. 148 is that it does not form a thick film which would make further handling disagreeable, and it is of such low viscosity that the user

Slight "Dragout" Losses

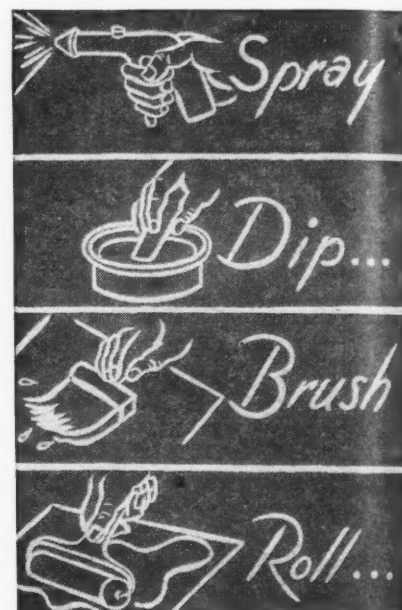


Actual unretouched photograph showing the corrosive effect of fingermarks on stainless steel.

has only slight 'dragout' losses and his 'drippings' are negligible.

"These two concerns have been satisfied to such an extent that we now supply them with practically 100% of their oil requirements."

Cities Service Lubrication Engineering



service is available without cost or obligation for any rust or lubrication problem. Call your nearest Cities Service branch office, (Arkansas Fuel Oil Co. in the South), or write to Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

* Names on Request



FOR EVERY
LUBRICATION PROBLEM
CALL **Cities Service**
FIRST!



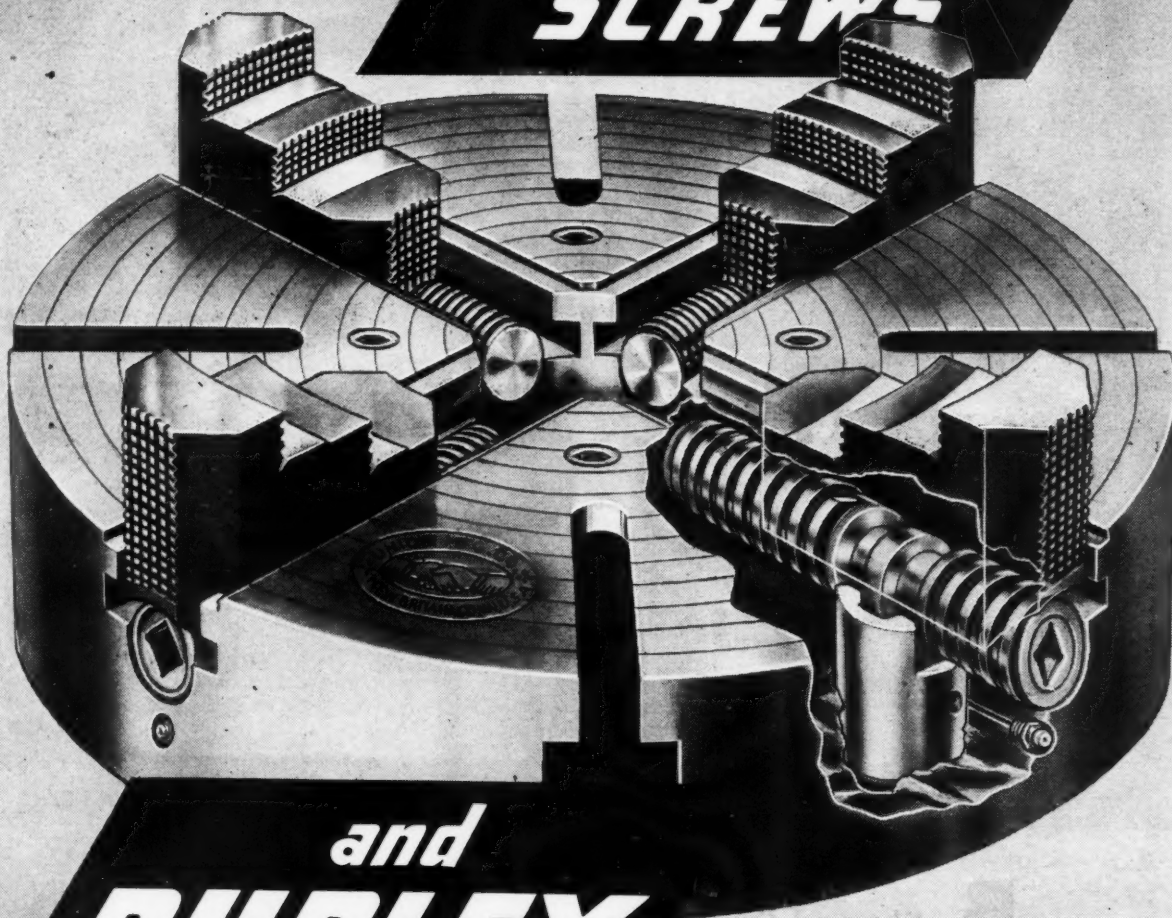
Bunting and Quality are synonymous in the field of Cast Bearing Bronze. Whether Bronze Bars or Bronze Bearings, Bunting Quality—controlled Quality—provides the exact answer. Available from complete stocks, carried by hundreds of Bunting Stock Carrying Distributors. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in principal cities.

47

Bunting

BRONZE BEARINGS ☆ BUSHINGS ☆ PRECISION BRONZE BARS

Union Chucks have
**LARGER
OPERATING
SCREWS**



and
**DUPLEX
THRUST**

**UNION
CHUCKS**

These Union Independent Chucks are giants all the way through. The extra wide jaws not only give you larger bearing surfaces but permit square threaded operating screws of larger diameter.

The exclusive Union Duplex Thrust for increased thrust area gives greater wear resistance, longer service and increased gripping power.

Special tough steels contribute the strength and wearability required by these parts. Complete specifications are given in our catalog Number 61 which describes and pictures the broadest line of chucks in the world. Write for a copy today, or present any chucking problem you may have to our Engineering Department.

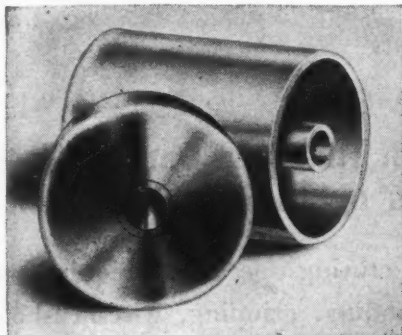
UNION MANUFACTURING COMPANY, 300 Church Street, New Britain, Conn., U.S.A.

248—MACHINERY, September, 1946

Lepel Spark-Gap Converters

AT WORK

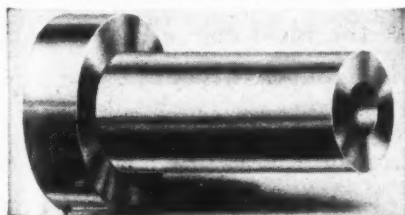
SILVER SOLDERING SIX ASSEMBLIES AT ONE TIME



Faced with a need for speeding up the silver soldering of a cup-and-tube assembly, one manufacturer called in Lepel engineers. Induction heating coils were designed to join six assemblies simultaneously. Jigs were designed to hold the pre-fluxed parts of the assembly and the silver rings in position for soldering.

Automatic control permits the operator to assemble parts for another group of six in a duplicate heating station while the first six is being heated, at the rate of 1 every 5 seconds, to the proper soldering temperature, using a 15 KW unit. Metal discoloration, soldering time, and cost were reduced to a new low.

SPEED-UP OF A SHRINK-ON



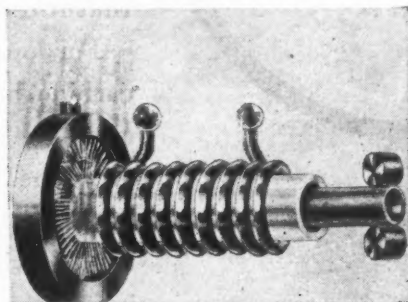
A manufacturer of machinery speeded up

IF YOU HAVE A PROBLEM in joining, heat treating or melting of ferrous or non-ferrous metals, chances are that some Lepel High-Frequency Induction Heating Unit can help you do a better, faster, more economical job. Lepel metallurgists and field engineers will be glad to make a thorough study of your specific problem, and help you put the right compact, Lepel unit on the job. Just call, or write, Lepel High Frequency Laboratories, Inc., 39 West 60th Street, New York 23, N. Y.

Note: Our new catalog is just off the press. Send for it.

a shrink-fit operation by applying his Lepel Induction Heating Unit to the job. The collar to be shrunk onto the tube was placed in a suitably designed load coil, and heated for a few seconds. Then the tube was inserted and the assembly allowed to cool. This is only one of the 25 operations performed by Lepel units in this one plant, which result in a saving of over 50,000 man-hours annually.

HARDENING STAINLESS-STEEL TUBING — TEN FEET A MINUTE, WITHOUT DISTORTION

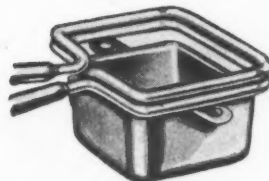


A stainless steel tubing is heated to about 2000° F and quenched in water for hardening. A tubing company is hardening such tubing at average rates of from 8 to 10 feet a minute. Heart of the automatic machine which performs this continuous heat-treating operation is a Lepel High-Frequency Induction-Heating Unit. A pair of rollers feed the tubing through a suitable heating coil and from there to the quench. One important result of this method of hardening is elimination of distortion, always a difficult problem in heat-treating.

NO. 2



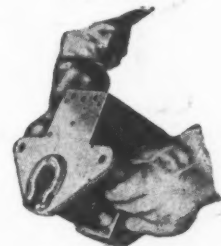
HARDEN



SOLDER



BRAZE



MELT



ANNEAL

STRESS RELIEVE

PREHEAT

NORMALIZE

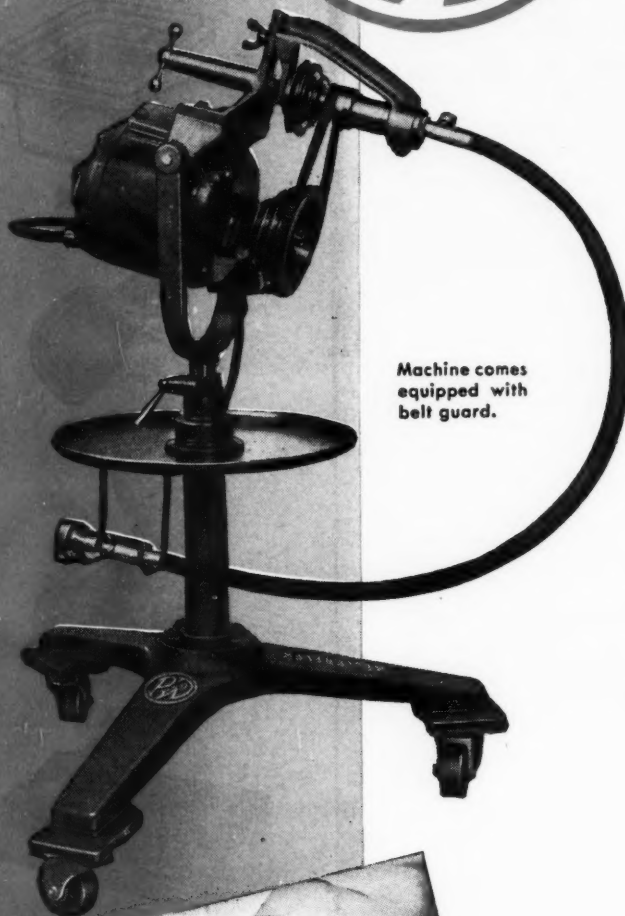
... ferrous and
non-ferrous metals
with the SAME
Lepel unit



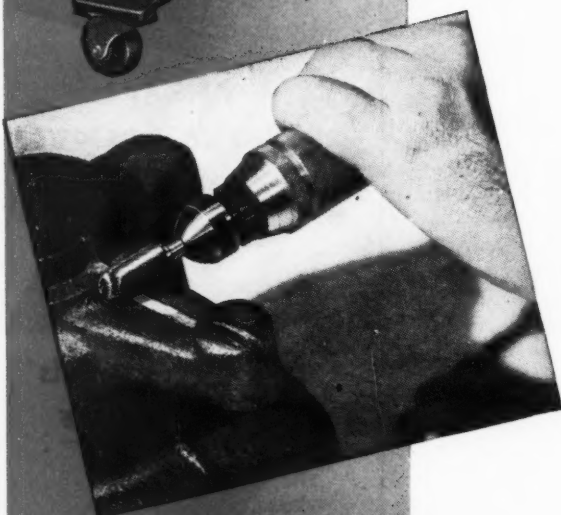
Lepel

High Frequency
INDUCTION HEATING UNITS

PIONEERS IN INDUCTION HEATING



Machine comes equipped with belt guard.



Burring the rough spots off a casting with the new high-speed KELLERFLEX.

Presents

THE NEW HIGH-SPEED KELLERFLEX

**For use with Tungsten Carbide Tools
at Speeds up to 33600 R. P. M.**

Where manufacturing operations require burring, filing, sanding, grinding, wire-brushing, or polishing the KELLERFLEX has proved that it does the job faster and better.

For operations where high-speed tungsten carbide burs are used Pratt & Whitney now offers the new KELLERFLEX machine. These are some of its fine features: speeds under load of 9600, 16800, 24000 and 33600 R.P.M. obtained with a minimum of cable wear, by increasing the tool-speed at the hand-piece end . . . a stable floor stand with easy-rolling casters . . . a heavy-duty $\frac{1}{2}$ HP electric motor with simple belt adjustment . . . adjustable clamp to set height at the most convenient working level . . . 360° horizontal swivel . . . and a full vertical swing.

The versatility of the KELLERFLEX reduces the cost of finishing considerably. From any angle — efficiency, economy, versatility, productivity — the KELLERFLEX is a time-saving investment. It is, indeed, "the most popular machine in the shop". Write on your company letterhead for complete information.

PRATT & WHITNEY

Division Niles-Bement-Pond Company
WEST HARTFORD 1 • CONNECTICUT



Where Care in Selection saves wear in production . . .

* Time-honored Borolon and Electroton Abrasive Products are now distinguished by the name Simonds.

SIMONDS
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Other affiliated Companies:

SIMONDS
STEEL WHEELS

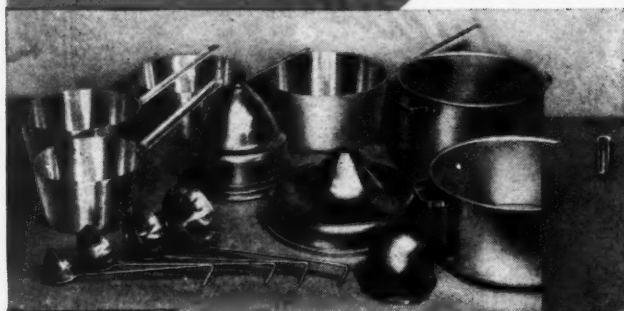
SIMONDS
GRINDING WHEELS

Accuracy of finish in centerless grinding, maximum rounding action and quick, safe removal of surface defects depend largely on your selection of the right grinding wheel. Get off to the right start by selecting yours from Simonds Abrasive Company's line of precision manufactured grinding wheels. From a wide range of Borolon* (aluminum oxide) and Electroton* (silicon carbide) products you can select wheels of the correct grain, grade and width of face to give fast cutting, long lasting action on through feed and infeed operations on every machine part and shape from forgings to valve tappets. Simonds Abrasive #1 bond Borolon Wheels are especially recommended. Balanced to close limits they break down at the right rate to permit superior finish and accuracy on centerless grinding production.

You will find the Simonds Abrasive distributor in your vicinity helpful in recommending the right wheels for your specific jobs. In addition the Simonds Abrasive Data Book is available to guide your selection. Write for your copy today.

SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA., DISTRIBUTORS IN ALL PRINCIPAL CITIES

MACHINERY, September, 1946—251

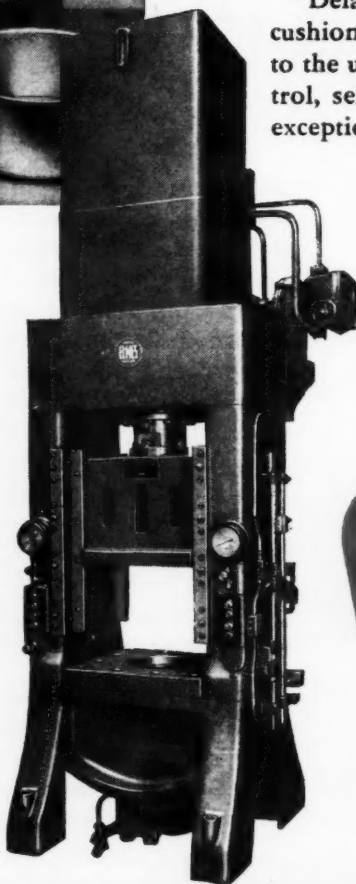


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Formed on the Elmes Press

Write today for all the facts about this press that *does everything* with the speed and ease you usually associate only with special-purpose designs. Built in the full range of sizes and capacities.

ELMES ENGINEERING WORKS
of AMERICAN STEEL FOUNDRIES
222 N. Morgan St., Chicago 7, Ill.

Also Manufactured in Canada



"Out of this World!"

...says J. W. Gatherer,
Gen. Mgr., Fred W. Gehrler Company,
Chicago

Perhaps you've never heard this expression applied to production equipment, but "*out of this world*" is how Mr. Gatherer sums up his comments on Elmes press performance.

"We're very well pleased," says Mr. Gatherer. "The press is doing a *beautiful* job. Convenient adjustments, full automatic 'inching,' and closure to six inches of daylight have greatly reduced our set-up problems.

"Delayed independent action of the hydraulic cushion return which prevents possible damage to the unsupported shape, precise automatic control, selective pressure, stroke, and speeds—and exceptionally *fast* operation—have improved both our production and our *products*.

"For our work of deep drawing and spinning steel, stainless steel, aluminum, and brass our new Elmes 100-ton hydraulic is the most capable and *versatile* press we've seen. We blank and draw in one operation. It's really marvelous equipment—out of this world!"

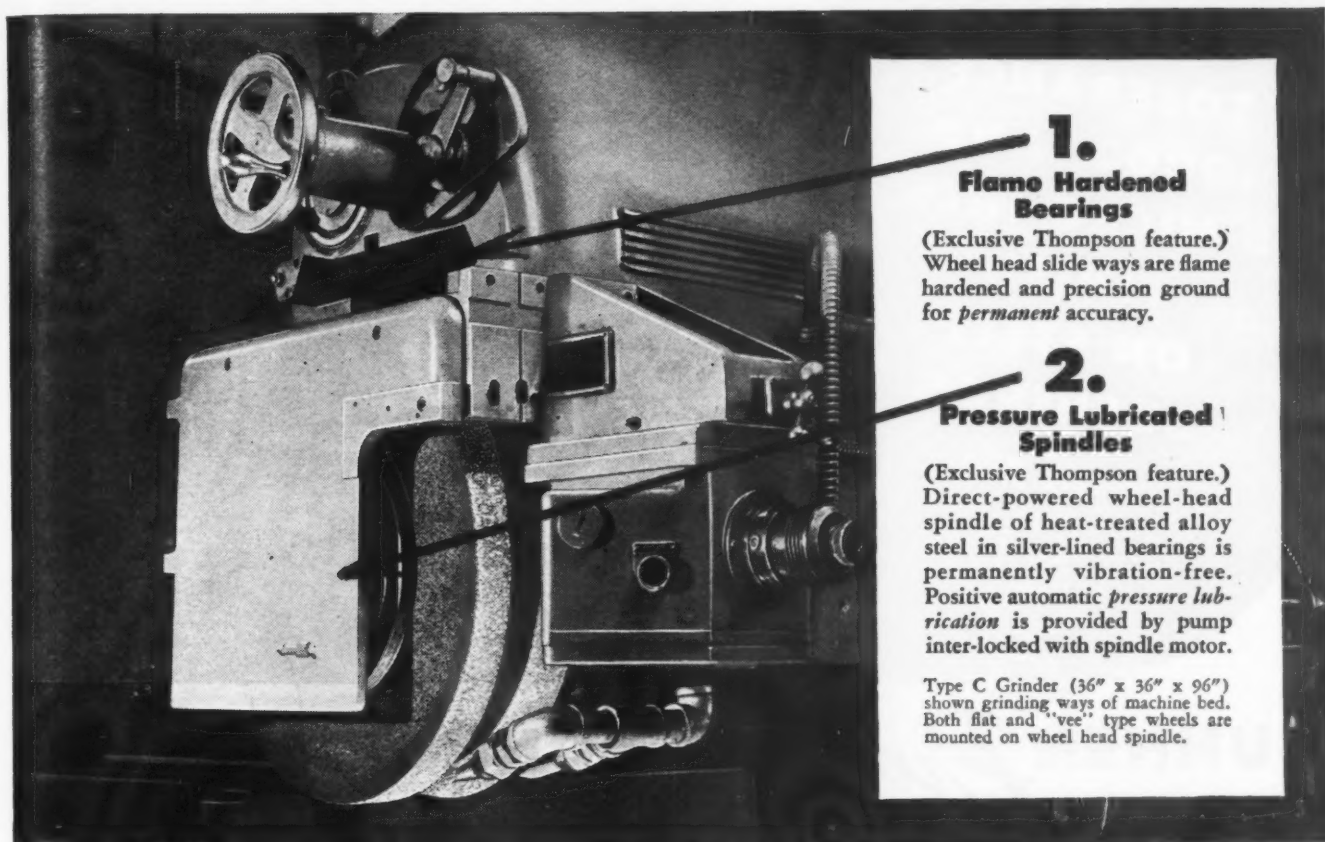
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Since 1851

HYDRAULIC EQUIPMENT

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

Only Thompson provides all these cost-saving developments!



1.

Flame Hardened Bearings

(Exclusive Thompson feature.) Wheel head slide ways are flame hardened and precision ground for permanent accuracy.

2.

Pressure Lubricated Spindles

(Exclusive Thompson feature.) Direct-powered wheel-head spindle of heat-treated alloy steel in silver-lined bearings is permanently vibration-free. Positive automatic pressure lubrication is provided by pump inter-locked with spindle motor.

Type C Grinder (36" x 36" x 96") shown grinding ways of machine bed. Both flat and "vee" type wheels are mounted on wheel head spindle.

3. Automatic Wheel Truing (pioneered by Thompson). The stationary truer provides instant availability of the truing tool. All wheel head slides are now equipped with hydraulic wheel truing feeds. It is not necessary to disturb the work piece in order to true the wheel.

4. Angular Wheel Truing (pioneered by Thompson). Attachment equipped with two truing tools, both sides of the included angle are trued simultaneously. Universal motor with speed variation 5" to 40" p.m. controlled by governor insures accurate, smooth truing for fine finish and precision on work piece.

5. Automatic Down Feed (exclusive Thompson feature). Feed cycle of .00025" to .004" is available at each table reversal for plunge cutting or at each wheel head feed reversal. Feed mechanism has automatic trip—can be pre-set for size control from elevating hand wheel graduations, duplicating accuracy to .0002".



6. Automatic Sparkout Control (exclusive Thompson feature). Allows table and wheel head to continue finishing cuts after automatic down feed device has reached pre-determined size. At fixed time after work size is reached, table rapid traverses to loading position and stops automatically. Usually furnished in conjunction with automatic down feed. This device maintains accurate duplication of dimensions and makes possible battery installations by releasing operator for loading other machines.

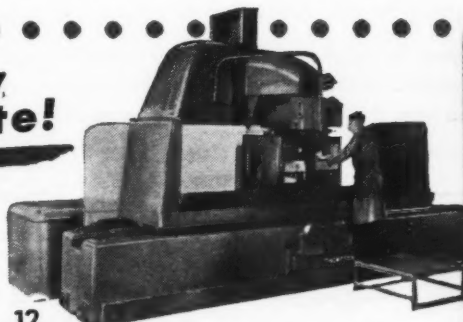
7. Anti-Friction Elevating Unit (exclusive Thompson feature). Friction between screw and nut

is reduced 70% to permit accurate feeding to .0001". Also minimizes effort of moving saddle assembly when making new setups without power elevation. Permits inexperienced operators to finish work by following handwheel graduations.

8. Double-Length Bed (exclusive Thompson feature). Massive double-length solid-cast beds are provided with heavy cross-section and numerous ribs at vital points to provide absolute rigidity for table.

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THE THOMPSON GRINDER CO., INC.

Before you buy
investigate!



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THE THOMPSON GRINDER COMPANY, INC.
SPRINGFIELD, OHIO

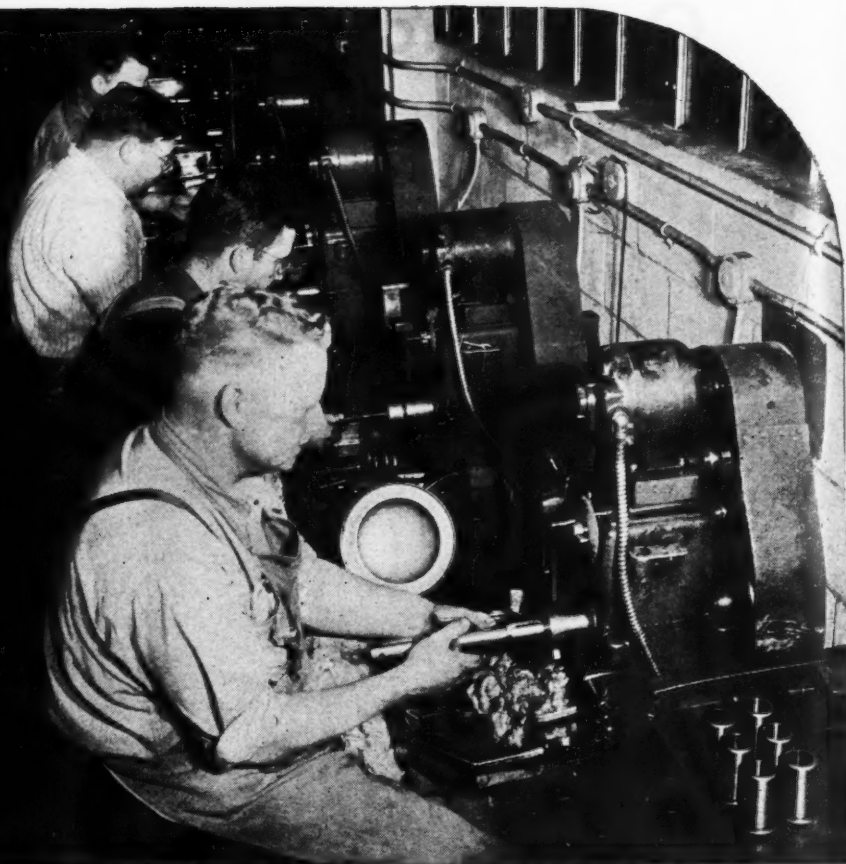
Thompson

SURFACE

Grinders

↓
↓
**TOLERANCE
.0003" AND
8 MICRO INCH
FINISH
ON STEEL
BUSHINGS**

with the



SUNNEN *Precision* HONING MACHINE

...at Universal Engineering Co., Frankenmuth, Michigan



The use of the Sunnen Precision Honing Machine on steel bushings at Universal Engineering Company is one of many hundreds where it is producing extremely accurate holes — and very smooth finishes on a production basis.

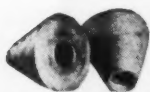
Users of the Sunnen Precision Honing Machine have found it practical, low in cost, easy to operate, quickly and easily installed and easy to set up. It corrects errors of out-of-roundness and taper — corrects wave effect or rainbow condition — maintains alignment between two holes.

The more recent models of this machine (shown at left) have a base assembly that houses a coolant pump. This pumping unit provides a steady flow of honing oil — which increases stone and mandrel life and increases the accuracy of the finished part.

Do you have an internal sizing or finishing problem that demands accuracy to as low as .0001" tolerance for size — and that also demands an absolutely straight hole? On any job from .120" to 2.625" in diameter, the Sunnen Precision Honing Machine may be the ideal solution.

Find out how you, too, can get these advantages that will profitably give you more accurate finishes. Write today for free literature — or ask a Sunnen engineer to show you how this equipment can be used in your plant.

Typical Jobs



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."



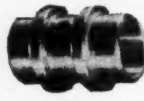
Bearing. A very small part. 2 micro-inch finish necessary.



Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro-inch finish.



Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.



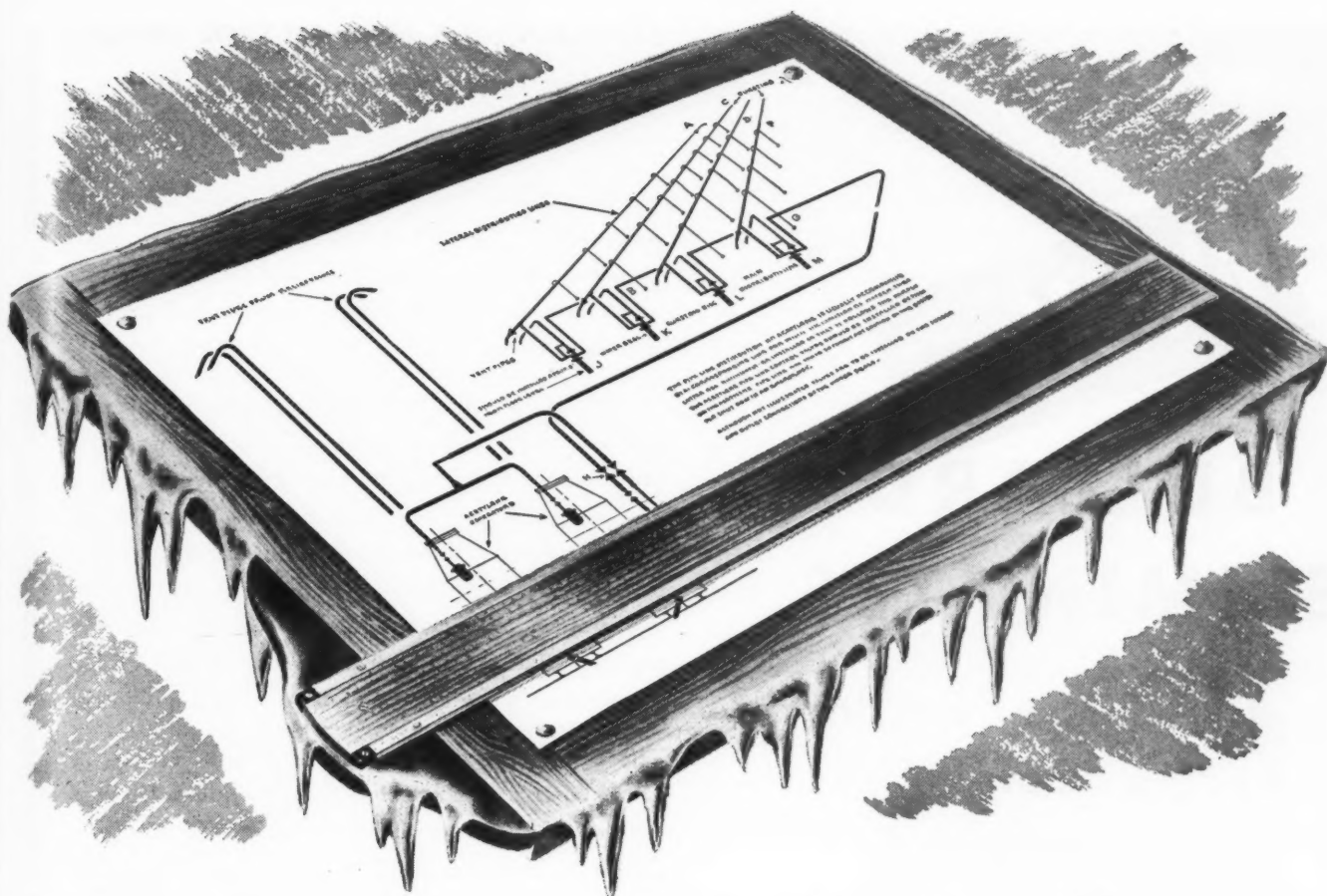
Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.



SUNNEN PRODUCTS CO.

7940 Manchester Avenue
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Canadian Factory: Chatham, Ontario



Before Your Oxyacetylene Pipe Line Plans

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ELIMINATES

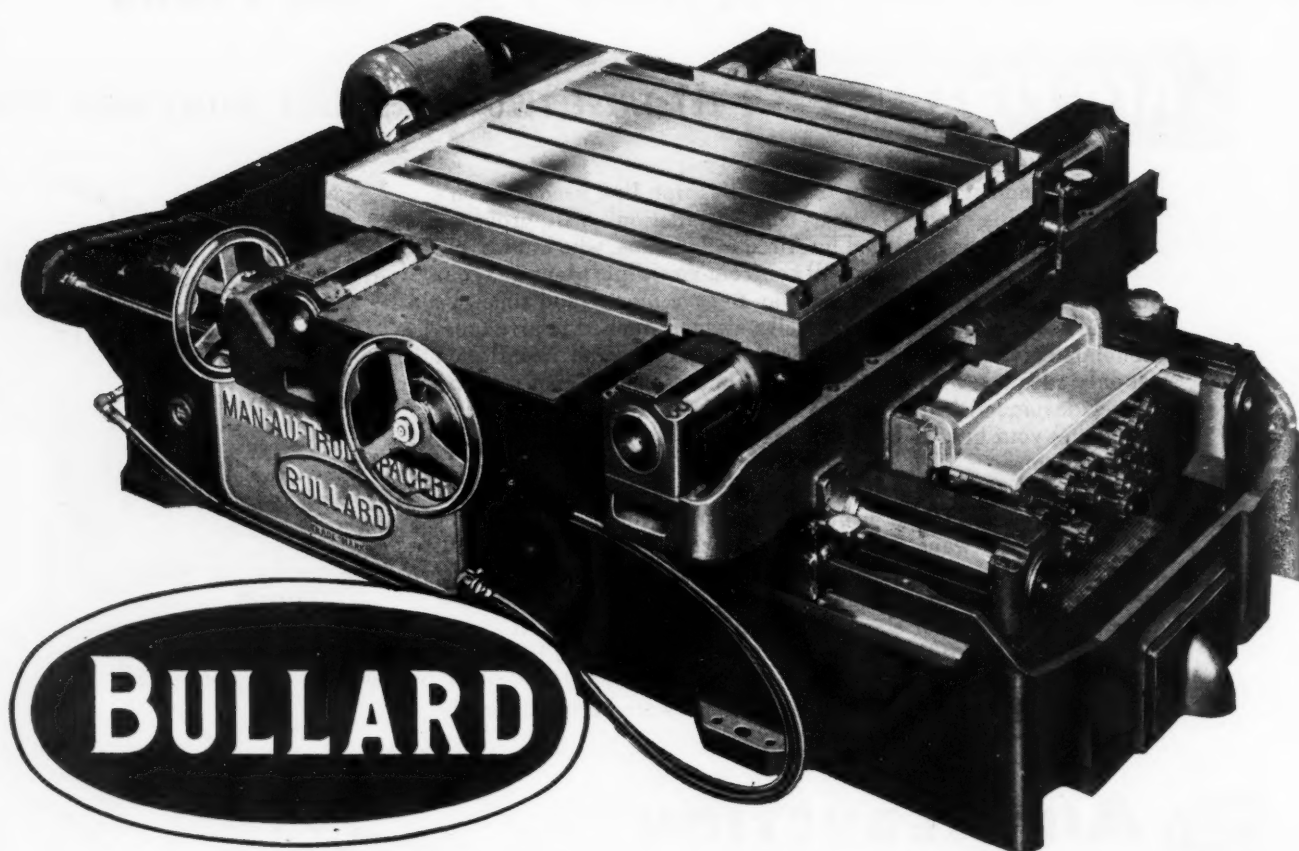
JIGS *for drilling,
boring, reaming,
tapping!*

New **BULLARD MAN-AU-TROL SPACER**
*Saves time, money and labor
in your Drilling Operation*

Designed for installation *by you* on your drills, the new Bullard MAN-AU-TROL Spacer, in most cases, eliminates hole-locating jigs...and the time, money and labor required to design, make, handle, repair and store them.

With unprecedented speed, ease and accuracy, you can set up the Spacer to do the work of jigs that may take weeks or months to make. Once its lateral and longitudinal position stop rods are set for a pattern of holes, the manually controlled, automatically operated Spacer will repeat that pattern indefinitely *to the highest standard of commercial spacing accuracy*. Extreme flexibility permits the use of the Spacer on a large variety of large and small work.

The results: faster, more accurate production... lower costs... less overhead... less human fatigue—all valuable factors in improving your competitive position. Write for MAN-AU-TROL Spacer Bulletin. The Bullard Company, Bridgeport 2, Connecticut.



**CREATES *NEW METHODS*
TO MAKE MACHINES DO MORE**

Made in 2 sizes — 30" x 20" (illustrated) for larger work on 4', 5' and 6' Radial Drills; and 4" x 4" for work usually done on smaller types of drills.

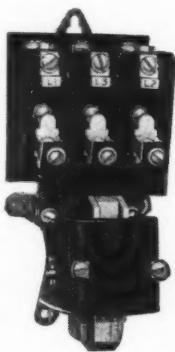
PLENTY OF ENGINEERING "KNOW-HOW"

but not a single special device—

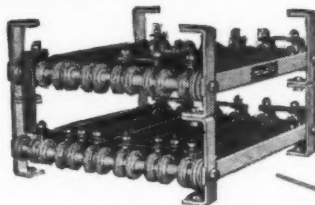
ON THIS "3C" MACHINE TOOL ELECTRICAL CONTROL PANEL

"3C" engineers built this heavy duty control panel for a Vertical Boring and Turning Mill entirely of standard Clark apparatus. It is designed to provide accurate control and overload protection for the motors which operate the machine.

Hundreds of machine tool control panels built of standard, time-tested and proved "3C" devices are serving in many varied industrial applications. "3C" engineers have the "know-how", and are at your service to solve similar problems.



BULLETIN 7707, TYPE DS, MAGNETIC CONTACTORS—for control of traverse motor. All terminals accessible from front. Contactor assembly mounted on cadmium plated steel plate.

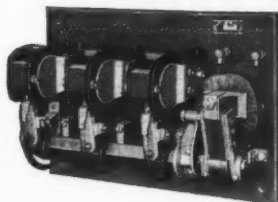


BULLETIN 110 RESISTOR. Edgewound type—non-breakable construction. Ventilated enclosure dissipates heat generated by resistors and keeps down ambient temperature inside the cabinet.



BULLETIN 7323 THERMAL OVERLOAD RELAYS. Two of these relays provide complete thermal overload protection for the traverse motor. Double-break silver-to-silver contacts have high contact pressure.

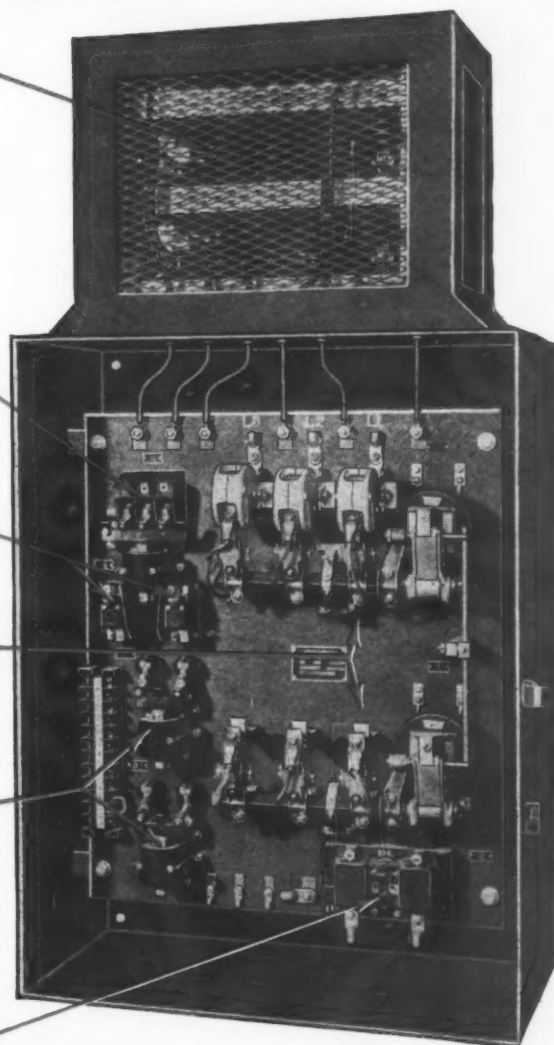
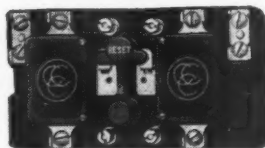
BULLETIN 7700 MAGNETIC CONTACTORS. Two three-pole mill-type contactors control operation of main motor. Patented hinged armature magnets provide adjustment to eliminate hum.



BULLETIN 7305 MAGNETIC CONTROL RELAYS—Heavy duty type, for circuit control. All contacts are visible and easily removable.



BULLETIN 7322 THERMAL OVERLOAD RELAYS—Duplex mill duty type, for providing thermal overload protection on main motor.



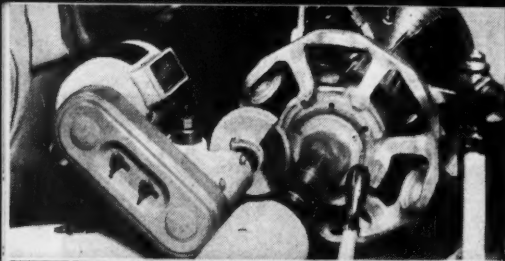
"3C" Control for Vertical Boring and Turning Mill, built from standard "3C" Electrical control devices.



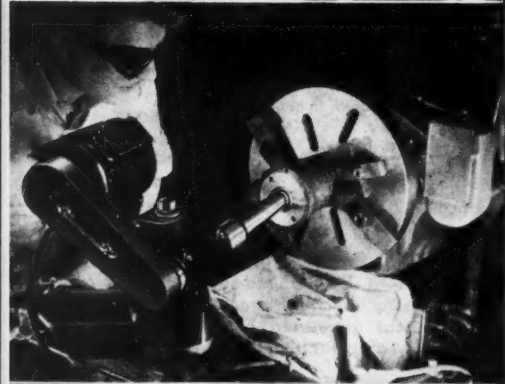
THE CLARK CONTROLLER CO.

1146 EAST 152nd ST., CLEVELAND 10, OHIO • EVERYTHING UNDER CONTROL

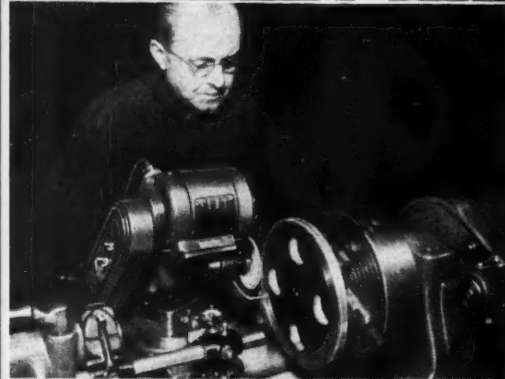




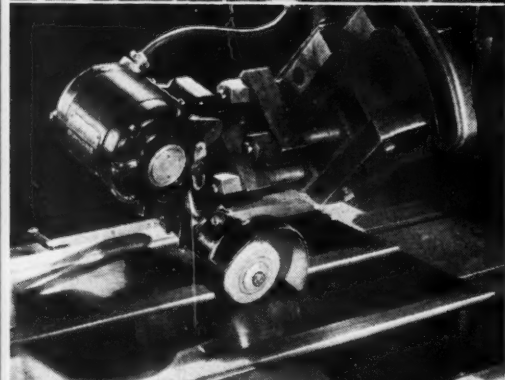
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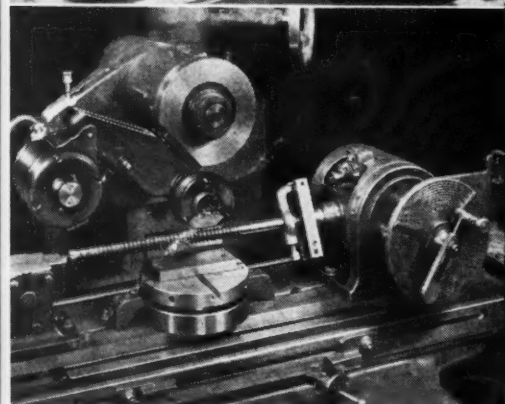
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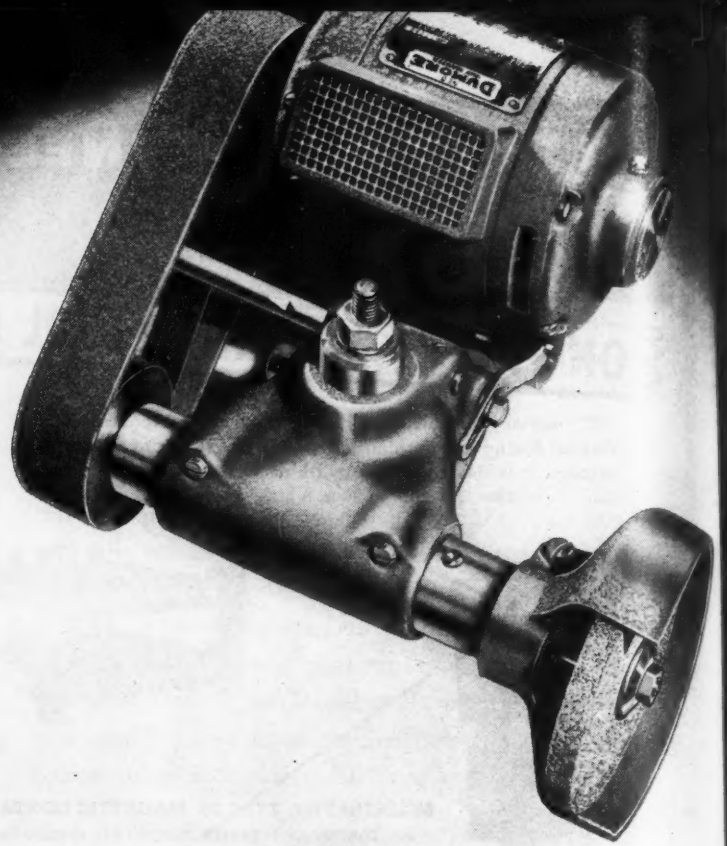
3



4



5



A Dumore cuts your costs by doing all **5** Grinding Jobs

1 external **2** internal **3** thread
4 surface and **5** tool grinding

You don't have to invest in five expensive machines to have complete grinding facilities. You can do all types of grinding by mounting a Dumore on a lathe, milling machine, or other basic tools you already have.

* Quickly set up for varied maintenance and toolroom tasks, dependable at steady production schedules, accurate to .0001" — Dumore will simplify your grinding problems and cut your grinding costs.

* Seven different models offer a power range from 1/14 to 1 HP with speeds up to 42,500 RPM. Interchangeable quills extend the capacity of individual grinders for internal work to a maximum depth of 24 inches. There is a size and type Dumore for every grinding need.

* Let your local distributor tell you the complete story of cutting costs with a Dumore. *You may find a solution to your own problem* in his data file of Dumore grinding methods. To add a valuable reference book to your own file, send the coupon below to The Dumore Company, Dept. I28, Racine, Wisconsin.

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Please send without obligation my copy of *Here's How*, your manual of the newest techniques in grinding.

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PRECISION TOOLS

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And *once* you had to carry a lot of heavy tools . . . but not now . . . because the Hollowell Speed Tool Kits have really lightened the tool burden. These are very complete, compact units . . . that fit comfortably in the palm of the hand . . . *with interchangeable tools held in the hollow handles.*

Another tool-saving, time-saving feature is the *locking swivel bit-chuck*, which replaces angular tools, gives extra leverage and makes it easy to reach hard-to-get-at places.

Handles are molded of Lumarith,* a Celanese* plastic; tools are of high-grade alloy steel . . . to make a durable, useful device . . . up to "Standard" specifications in every way.

Obtainable at Suppliers throughout the country. If your Supplier does not carry these Kits, send his name to us, along with yours, and you will be taken care of promptly.



HOLLOWELL SPEED TOOL KITS

WITH INTERCHANGEABLE TOOLS

The "Socket Wrench" Kits, in two sizes for a greater range of tools, contain 6 and 12 point Hex Sockets from No. 4 up to and including 1/2".

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The "Auto" Kits contain those small tools most necessary for auto maintenance . . . Phillips, Flat and Clutch head bits and a Reamer.

The "Home" Kit contains a clever assortment of frequently needed tools: Tack Lifter, Gimlet, Reamer, 2 Flat and a Phillips screw driver bit and a Bottle Cap Opener.

Excellent ideas for gifts or prizes.

Handles Molded of Lumarith* A Celanese* Plastic

Kits: Patents Pending

OVER 43 YEARS IN BUSINESS

*Reg. U. S. Pat. Off.

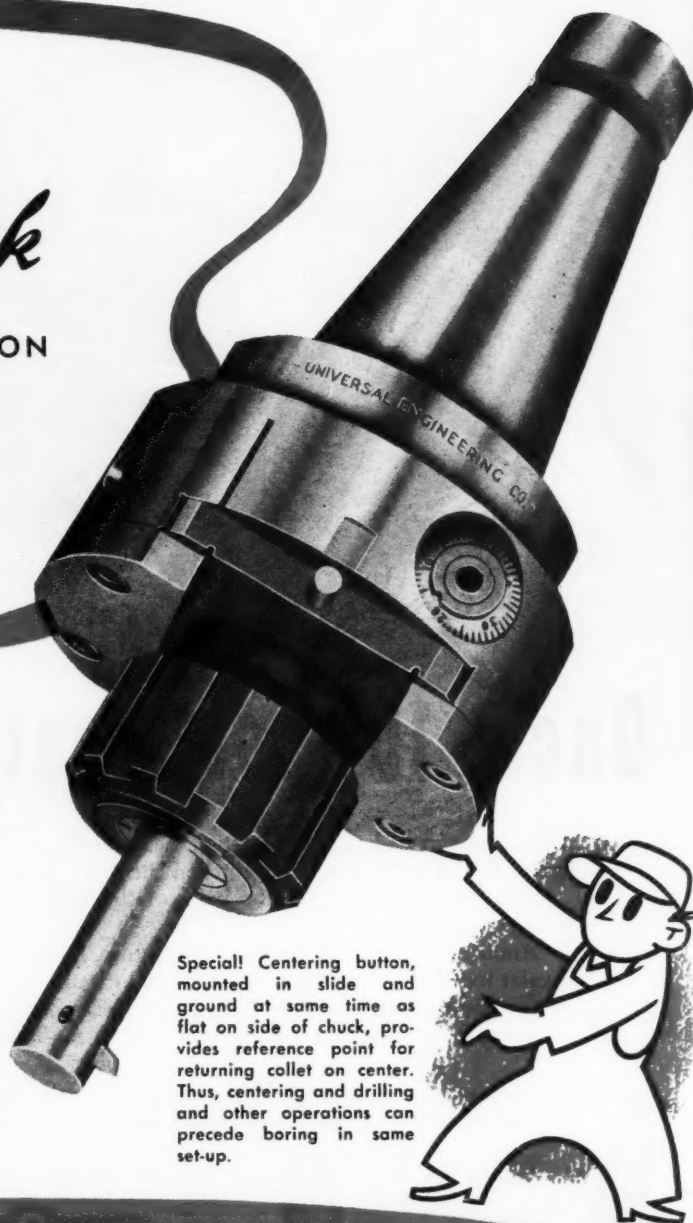
STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 22 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

Universal Boring Chuck

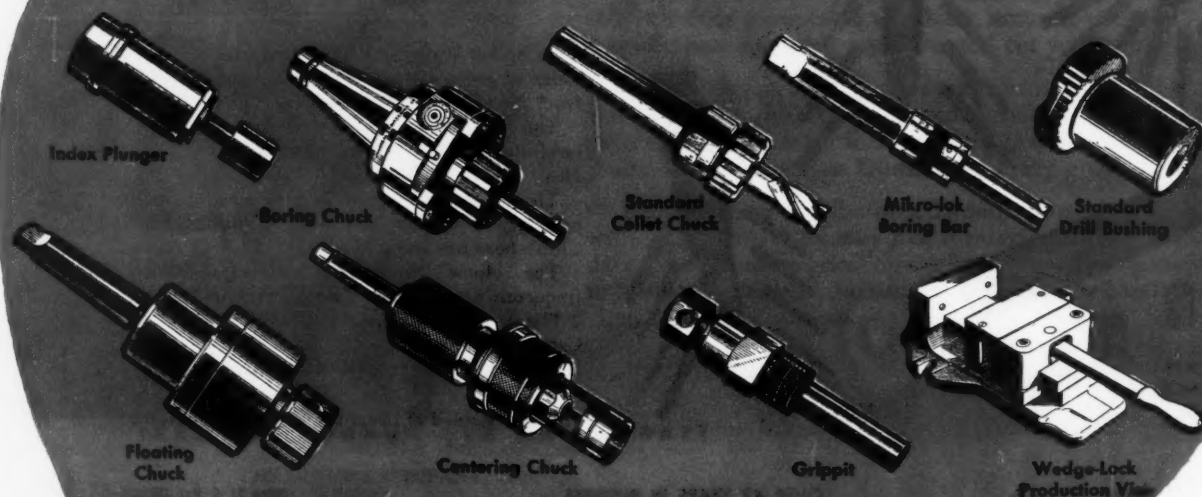
RIGID, CONVENIENT, PRECISION
PERFORMANCE ON MILLING
MACHINES, BORING MILLS,
TURRET LATHES

Here's the outstanding tool of its type on the market—one that will greatly simplify your boring operations. The Universal Boring Chuck holds bars firm and rigid in boring mills and milling machines, and is ideal for lathe use in drilling and turning eccentric parts. Special construction permits the bar to be advanced or retracted to suit the work, speeding production. Feed screw dial can be adjusted to zero setting in any position in feed range, and anti-backlash screw assures .0005" accuracy in setting. Offset slide lock holds location after feed adjustment has been made. Available in straight or taper shank to accommodate bars from $\frac{3}{8}$ " to 1". For easier—faster—and more accurate boring, it will pay you to standardize with Universal Boring Chucks. Write for complete information.



Special! Centering button, mounted in slide and ground at same time as flat on side of chuck, provides reference point for returning collet on center. Thus, centering and drilling and other operations can precede boring in same set-up.

UNIVERSAL TOOLS THAT WILL INCREASE
PRODUCTION AND EFFICIENCY IN YOUR PLANT.

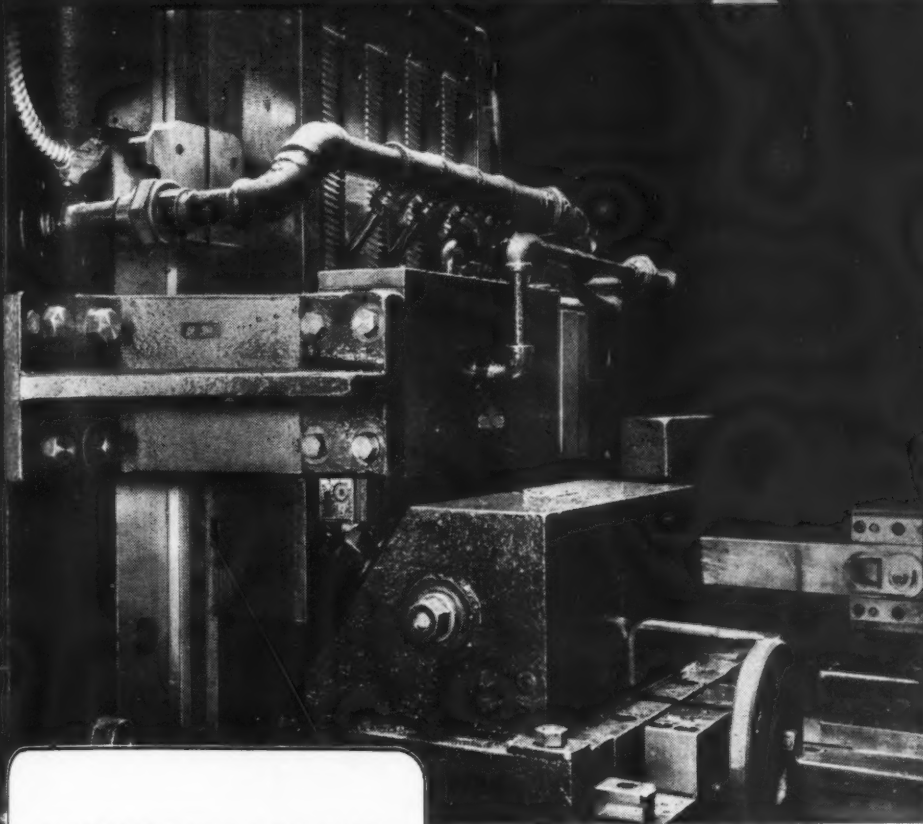


UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN

MORE GOLD...

with Oilgear Fluid Power Broaching



ADVANTAGES OF OILGEAR BROACHING MACHINES

High broaching speeds, higher return speeds. Infinitely adjustable cutting and return speeds. More efficient use of electric power permitting smaller motors. More efficient use of the fluid medium, allowing oil reservoirs as little as 1/5th the size of others; more compact and usable machines. Wide and roomy tool slides and shuttle tables, manual, semi-automatic and full-automatic cycle control at no extra cost. Positive control interlock with fixture operation.



In 1938, an Oilgear Surface Broaching Machine was sent up into the wilds of Canada, hundreds of miles from anywhere. It was to try its hand at sharpening rock drill bits used in Hollinger Consolidated Gold Mines Ltd. operations as against both hot milling and conventional steel sharpening.

Here is what happened: to date, this single machine has sharpened more than 4 million 551 thousand bits. It sharpens 175 bits per hour as against 70 by the hot milling method. With two men for the broaching and turning operations, it equals the output of three of the conventional steel sharpening machines with six men. Oilgear Broaching takes off less metal, yet gives sharper, cleaner edges, more efficient drilling. It averages 25,000 drill bits per tool regrind. Aside from a minor pump adjustment on March 18, 1939, it has required no maintenance whatsoever.

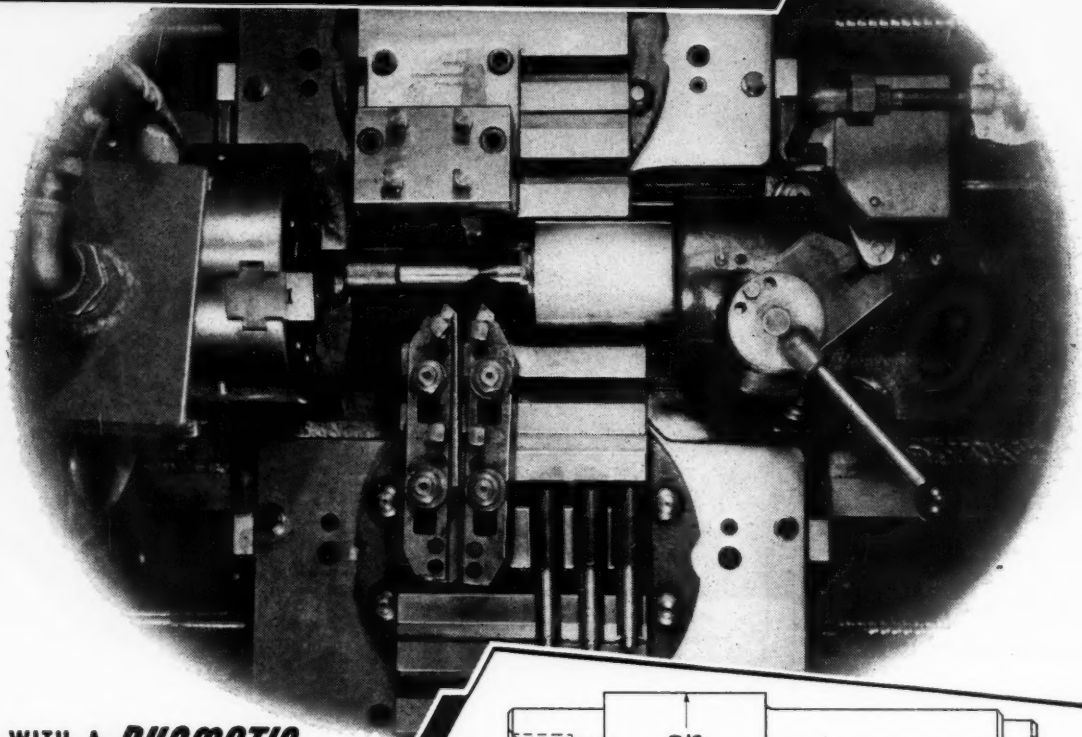
"(The) performance (of this Oilgear Broach) has been the main factor in our choice of another Oilgear machine for future operations," writes Mr. F. Wolnod of the Hollinger Company.

The gold you dig for may not come from mines. But you will get *more* "gold" if you turn to Oilgear Fluid Power Broaching. THE OILGEAR COMPANY, 1312 W. Bruce Street, Milwaukee 4, Wisconsin.

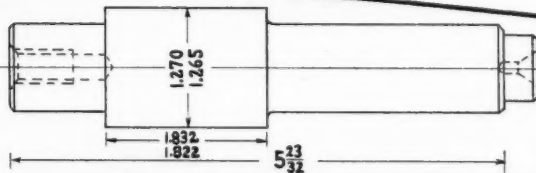
Oilgear manufactures a complete line of broaching machines... horizontal and vertical for every internal and external broaching operation.

Oilgear Fluid Power

**2A DUOMATIC
CUTS 37 HOURS
OFF THIS SHAFT JOB**



DO IT WITH A **DUOMATIC**
the **LATHE** with a
MAN INSIDE



To set up and run 500 pieces in two operations on this part required 55 hours on an engine lathe. On the 2A Duomatic the two operations (setups and 500 pieces) took only 18 hours . . . **37 HOURS SAVED!**

3 BIG REASONS why the 2A Duomatic makes such remarkable savings in time and costs:

1. **NO CAMS TO CHANGE CYCLES.**
Diameters and lengths are automatically changed by simple dial and nut adjustments. Cam costs are out . . . setup time is reduced two-thirds.
2. **MORE TOOLS DO MORE JOBS AT ONE TIME.**
Separate tool slides and carriages, front and

rear, operate independently or together . . . permit any combination of turning and "in" or "out" facing cycles.

3. **RESPONSIBILITY BUILT INTO THE LATHE.**
The 2A Duomatic is fully automatic . . . enables unskilled operators to handle complex jobs. The worker just loads, starts the cycle, and unloads the workpiece . . . the lathe does the rest.

L & S Engineers can prove how your higher production costs can be reduced sharply with Duomatic Lathes. Write on your company letterhead for detailed bulletins Nos. 601 and 620.

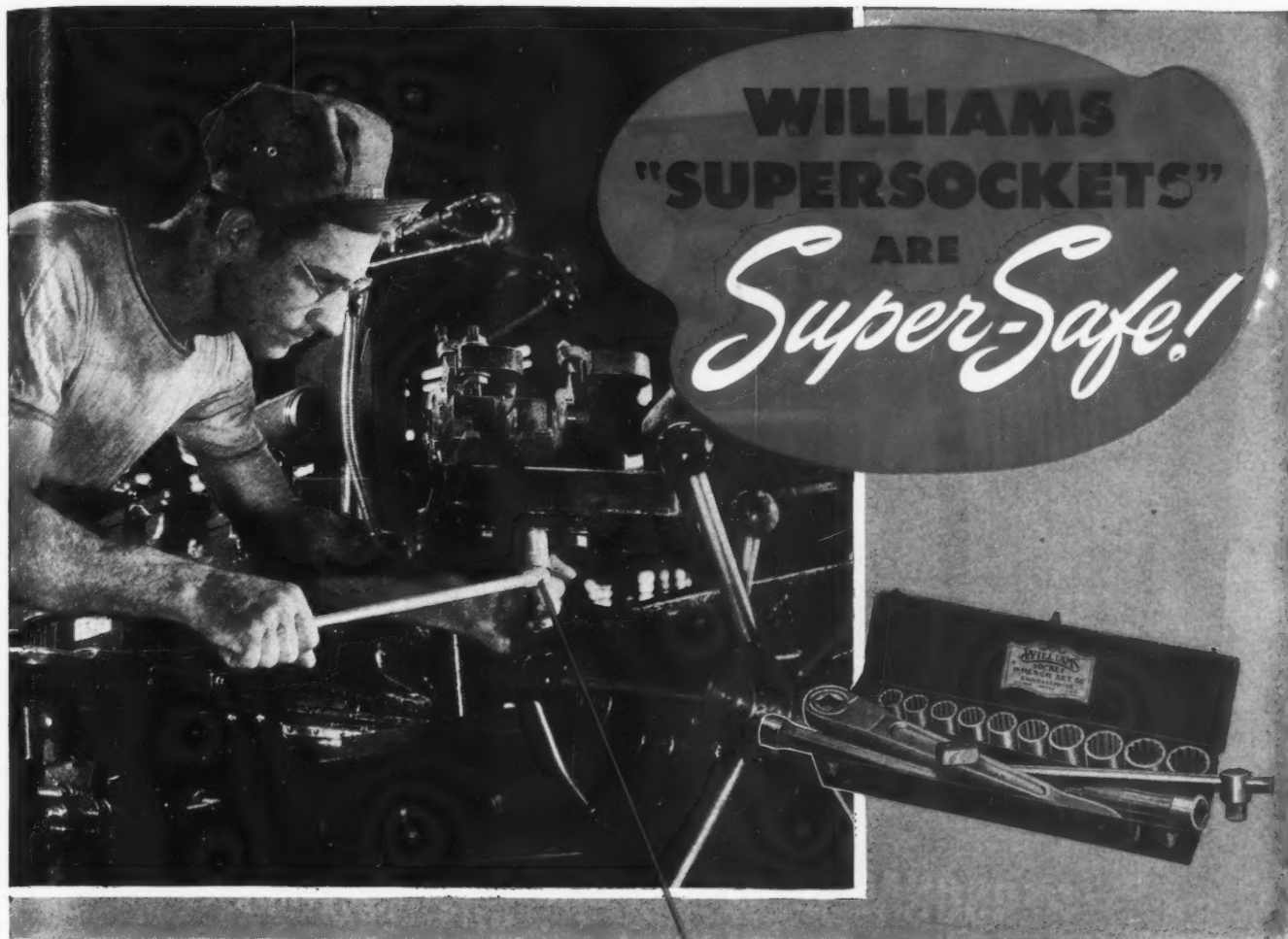
THE LODGE & SHIPLEY
MACHINE TOOL CO.



CINCINNATI 25, OHIO, U. S. A.

MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

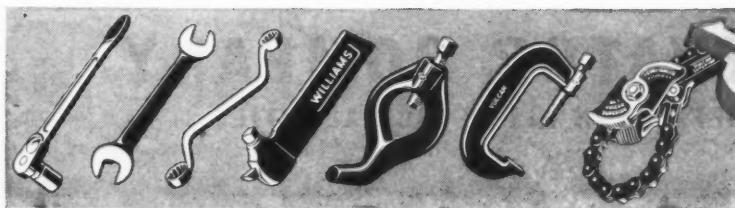
262—MACHINERY, September, 1946



● No type of wrench offers a surer grip than Williams "Supersockets." This operator knows his wrench can't slip although he is unable to see the cap screw he is loosening. He knows he can apply a hard pull without danger of battered hands or more serious injury. He's a safe and efficient worker because he has safe and efficient tools!

And super-safety is only one feature of Williams "Supersockets." With their endless combinations of handles, accessory parts and sockets, they provide industry's most flexible wrench system. Made in five patterns, with drives from 1/4" to 1" square. Sold by leading Industrial Distributors everywhere.

J. H. WILLIAMS & CO., BUFFALO 7, N. Y.



WILLIAMS
DROP-FORGINGS AND
DROP-FORGED TOOLS

Otis maintenance man measuring the clearance between brake drum and brake lining. Standard clearance for the brake illustrated is six one-thousandths of an inch — or about twice the thickness of a human hair.



Every elevator under Otis Maintenance receives attention that is made to order. Every inspection is a personal service; adapted to meet specific conditions, volume of traffic handled, and type of equipment installed.

This service is brought to your building through one of the 245 local Otis offices specializing in your requirements and the needs of your community.

It is important to note that Otis Maintenance does not stop there. Each local office is backed up and supervised by a Maintenance district office, which provides special tools and materials. Back of the districts are ten zone offices providing even greater facilities. Back of

the zones is the headquarters organization with all of the engineering, research and production capacity of the manufacturer of more than half of the world's elevator equipment.

Through all of this organization your personal Maintenance service never loses its identity. Individual reports on performance are received and analyzed straight through to headquarters. Every resource of the entire Otis Elevator Company is devoted to making your service meet Otis standards.

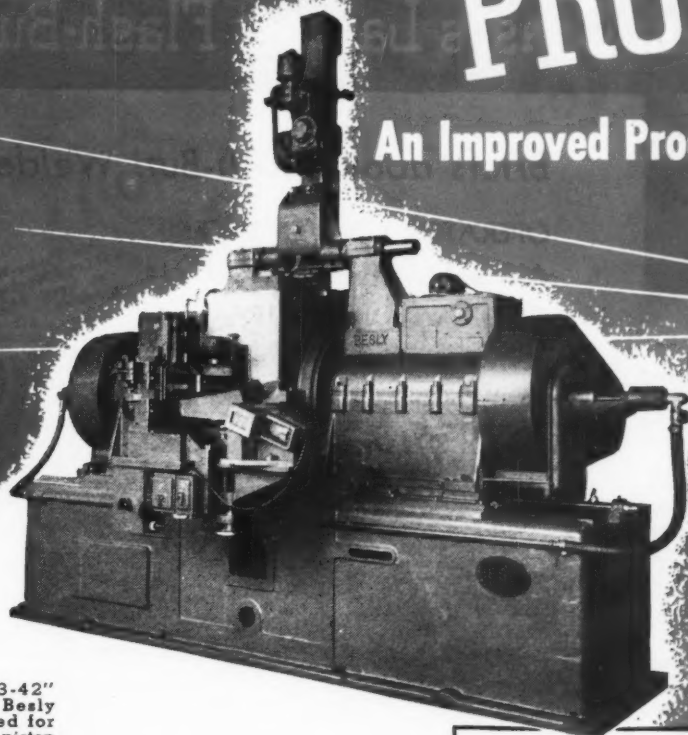
Complete, flat rate Maintenance Service for Otis elevators is available through your local Otis Elevator Company office.



ELEVATOR COMPANY
OFFICES IN ALL PRINCIPAL CITIES

MAINTAINING PROFITS...

An Improved Product Now Costs Less



**BESLY
GRINDERS**

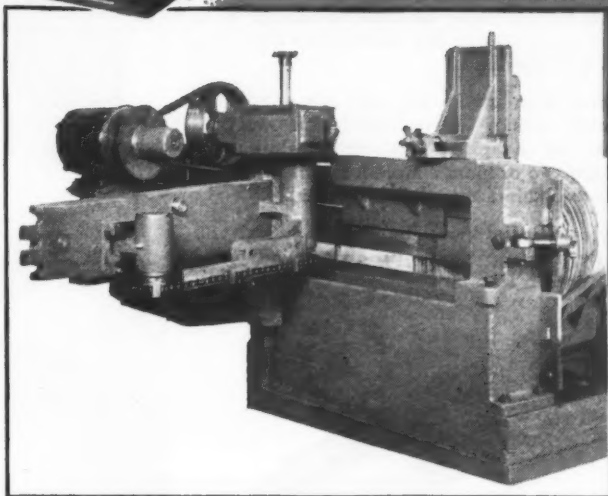
● Above: No. "253-42" Double Spindle Besly Grinder equipped for grinding cast iron piston rings. This is used with chain feeder and vibrator-operated trough.

● At Right: Chain feeder. Note accessibility of feeding chains and ease of adjustment for rings of different diameters. Vibrator trough appears at extreme right.

Accuracy previously considered impossible in high speed grinding is now achieved with this Besly Grinder—due to great rigidity and larger grinding members. For instance, on automotive size piston rings, a "253-42" Besly Grinder attains a speed of 500 passes a minute. In spite of this high rate, rings are held within .0003 for size, flatness and parallelism—with a 10 to 12 micro-inch finish. Oil is used as a coolant. Power truing device employs either diamonds or cutters. Grinding wheel adjustments are quickly and easily made with conveniently located push button controls.

Besly engineers are ready to discuss with you the many possible applications of highly-specialized Besly Grinders to the improvement in your product and the reduction of manufacturing costs.

Write us today!



If you are considering a BESLY GRINDER from U. S. Government Surplus Stocks...

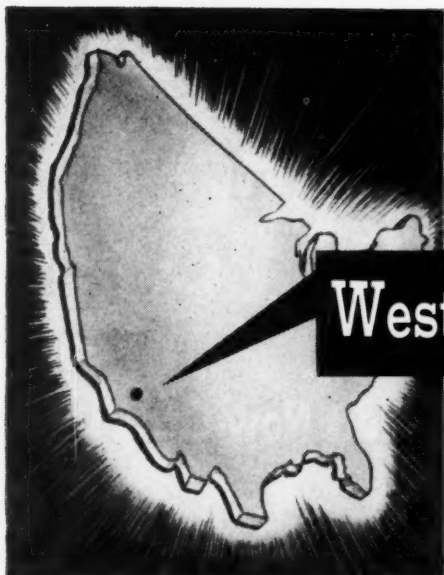
Ask us to help you select and adapt such machines to meet the specific needs of your production. Many of these machines were originally *specials* and are not suitable for general work.

BESLY

**BESLY GRINDERS AND ACCESSORIES
BESLY TAPS • BESLY TITAN ABRASIVE WHEELS**

CHARLES H. BESLY AND COMPANY, 118-124 N. Clinton St., Chicago 6, Ill. • Factory: Beloit, Wis.

MACHINERY, September, 1946—265



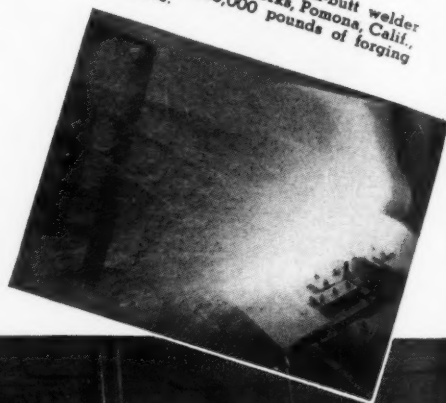
240,000 Pounds Forging Pressure

West Coast's Largest Flash-Butt Welder

Briefs about Flash-Butt Welders

OPERATOR CONVENIENCE
AUTOMATIC OPERATION
GOOD WELD QUALITY
LOW POWER COSTS
FAST OPERATION
MANY SIZES

This Taylor-Winfield flash-butt welder at Loud Machine Works, Pomona, Calif., can exert 240,000 pounds of forging pressure.



Taylor-Winfield makes all sizes of flash-butt welders from 20 to 1200 K.V.A. This welder, the West Coast's largest, has an 800 K.V.A. rating.

The largest flash-butt welder on the west coast, a Taylor-Winfield machine, rates at 800 K.V.A. and has a forging pressure of 240,000 pounds.

This welder will weld either solid bar stock, tubing, structural sections of low carbon, alloy, or stainless steels. An effective cross section area of carbon steel as large as 24 sq. in. or one as small as 1 sq. in. can be welded. The tubing range extends up to lengths of 45 feet and diameters of 12".

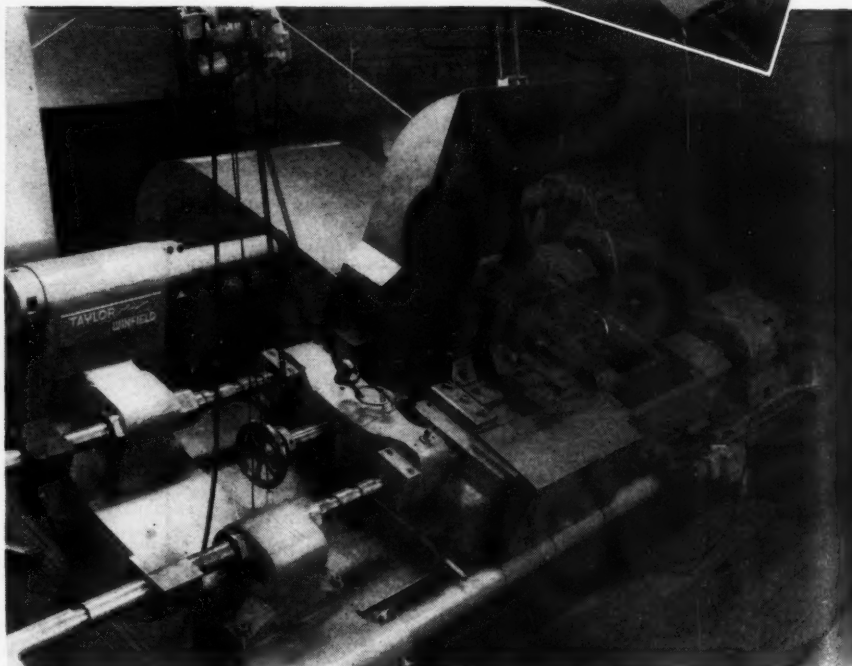
Loud Machine Works, Pomona, Calif., uses this high production welder in the manufacture of oil country products, including tool joints to drill pipe; all sizes of tubing; truck axles of solid ends and tube torque members; and gear blanks.

In your own production, you can effect substantial savings in machining time and material by adapting flash-butt welding for joining two or more simple forgings or stampings to obtain a complicated assembly.

Taylor-Winfield will be glad to assist you in setting up your products and your production line.

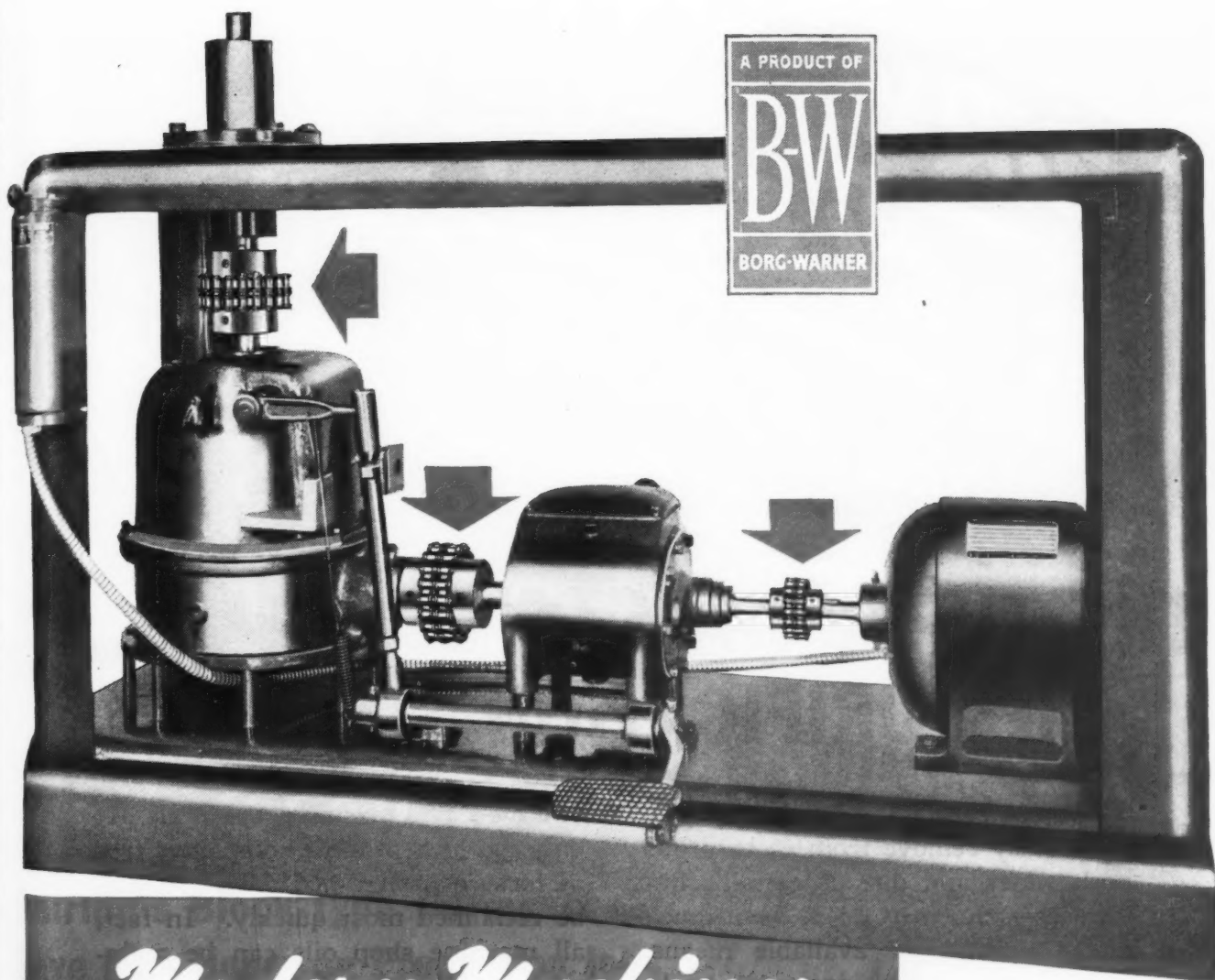


Flash welded joint on "pin" end of oil well rotary drill pipe, SAE 3135 to SAE 1040 steel, before removing flash.



The **TAYLOR-WINFIELD**
CORPORATION
WARREN . . . OHIO





Modern Machines Deserve Morse Couplings

Western Manufacturing Company of Detroit uses Morse Flexible couplings at all shaft-connecting points in their Model 9000-E transmission and secondary speed reducer.

Morse Flexible couplings—in either roller chain or silent chain design—are available in a wide variety of **stock sizes**. Data on larger sizes on request.

MORSE CHAIN COMPANY — Ithaca, N.Y. — Detroit 8, Michigan

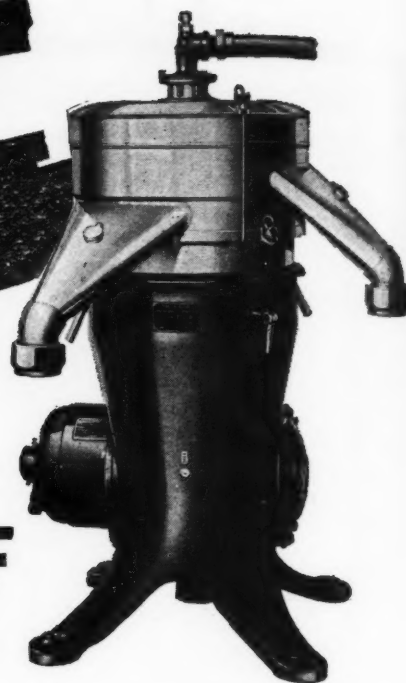
MORSE *ROLLER and SILENT CHAINS*

SPROCKETS • FLEXIBLE COUPLINGS • CLUTCHES

MACHINERY, September, 1946—267

**DRY...
CLEAN...
and FAST...**

THE THREE 'MUSTS' OF OIL PURIFICATION



DE LAVAL Oil Purifiers continuously remove from factory oils both water and dirt or metallic impurities—and they do it very much faster than other available means. Centrifugal force instantaneously separates out any undesirable moisture, whether a scant cupful or many gallons per tank of oil. Thus lubricating oil, hydraulic oil, slushing oil, vacuum pump seal and other oils which must be kept dry are constantly maintained in best condition by De Laval centrifugals.

Those oils demanding constant freedom from solid impurities—such as honing oil, grinding coolant or parts-washing solutions—are also maintained more efficiently by means

of a De Laval machine. Such oils not only can be kept more completely free of foreign matter but they, too, can be reclaimed most quickly. In fact, all machine shop oils can be maintained as part of a continuous-flow system.

There are many other uses for De Laval centrifugals in metal-working plants, all of them profitable and time-saving.

Write for Bulletin MM-1, sent free on request.

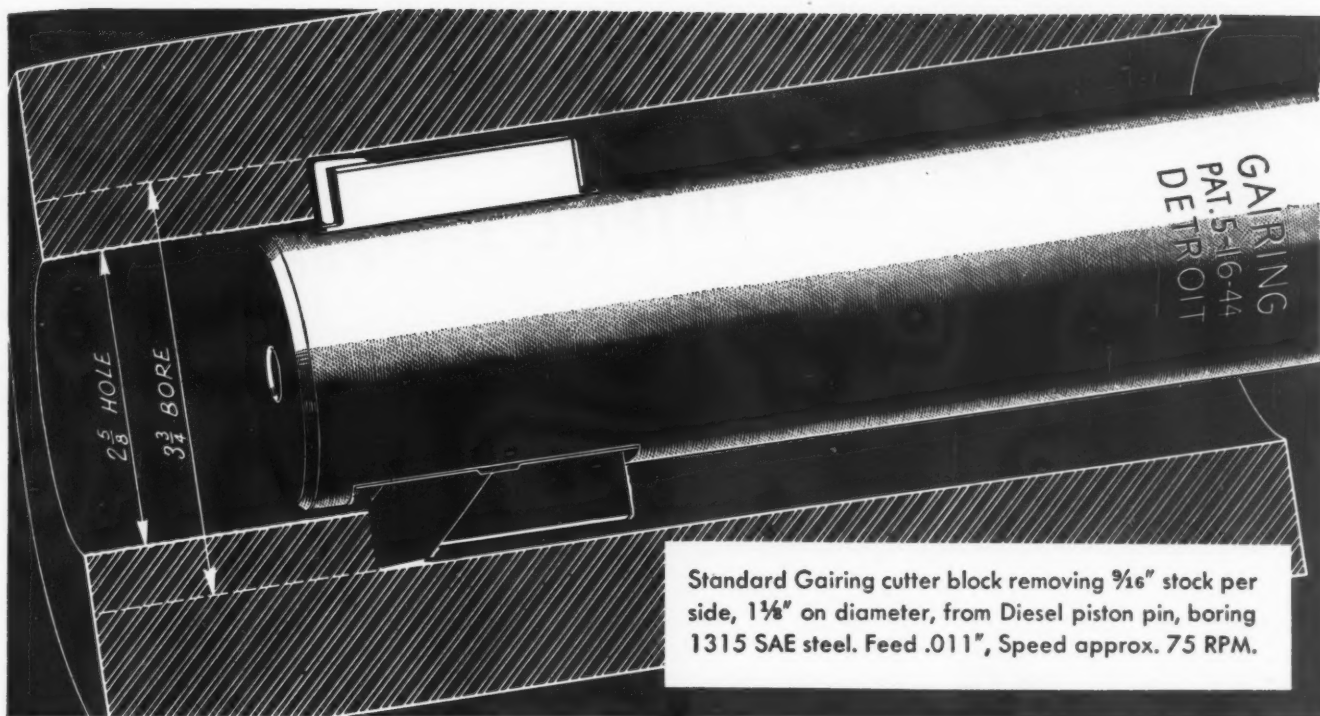
THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19

THE DE LAVAL COMPANY, Limited
MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

DE LAVAL

**PURIFIERS and
CLARIFIERS for
FACTORY OILS**

FOR GREATER OPERATING EFFICIENCY



Standard Gairing cutter block removing $\frac{9}{16}$ " stock per side, $1\frac{1}{8}$ " on diameter, from Diesel piston pin, boring 1315 SAE steel. Feed .011", Speed approx. 75 RPM.

FOR *rough* BORING TOO—

Gairing's Block-Type Boring Tools Save Man Hours on Production Jobs

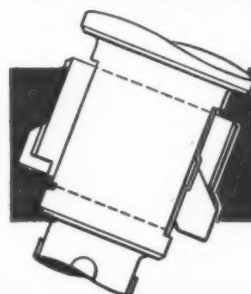
The sturdy Gairing boring bar, not weakened by the conventional centering hole, withstands the twisting strain of heavy cutting or fast removal of metal.

The standard block cutter, shown above, is but one of many instances where Gairing block-type boring tools demonstrated in actual production to be equally successful on roughing operations as on semi-finishing and finishing cuts.

And man hours are actually saved. Blocks are quickly and easily changed. They are pre-set to size, are always perfectly centered, eliminating the cut-and-try method of adjustment.

Standard and micrometer blocks are made in sizes ranging from $1\frac{1}{4}$ to $7\frac{3}{4}$ ". Larger sizes to order.

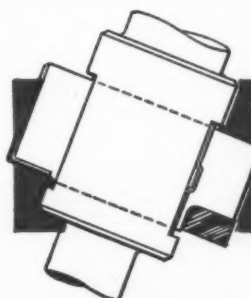
For full information request our complete Boring Tool catalog.



Standard Gairing cutter blocks can be furnished regular type for boring and floating type for finishing cuts.



Standard Gairing micrometer blocks have one blade, are quickly adjustable to within .001 in. diameter.



Special solid type blocks of high speed steel or tipped with hard alloy are designed for roughing or facing.



Special blocks are designed for multi-diameter work, combined boring, chamfering, counterboring, facing.



THE GAIRING TOOL COMPANY, Detroit 32, Michigan

NO OTHER PUMPS FIT THE JOB

LIKE TUTHILL STRIPPED PUMPS

Tuthill Stripped Pumps are designed to meet the ever-increasing demand for pumps that can be built into machines to improve their appearance, save space and reduce cost to machinery manufacturers.

At the outset, these pumps were sold merely without the supporting bracket. Then, as the idea of incorporating the pump into the design of the machine was carried further, manufacturers decided to build the simple functions of the housing into their machines and requested the pumping elements only—the rotor, idler and cover assembly.

Today, Tuthill is your only source for both of these types of stripped pumps in sizes and models to meet your requirements in lubrication, coolant, hydraulic and liquid transfer service. Capacities range from 1 to 50 g.p.m. Stripped Pumps are also available in the automatic reversing type as illustrated above.

Write for Tuthill Stripped Pump Bulletin.

TUTHILL PUMP COMPANY
939 East 95th Street • Chicago 19, Illinois

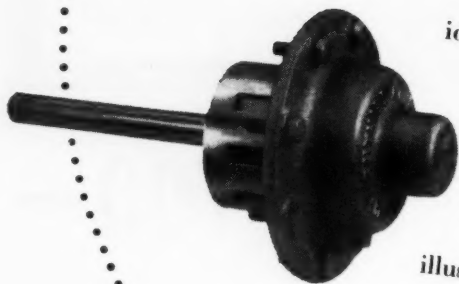
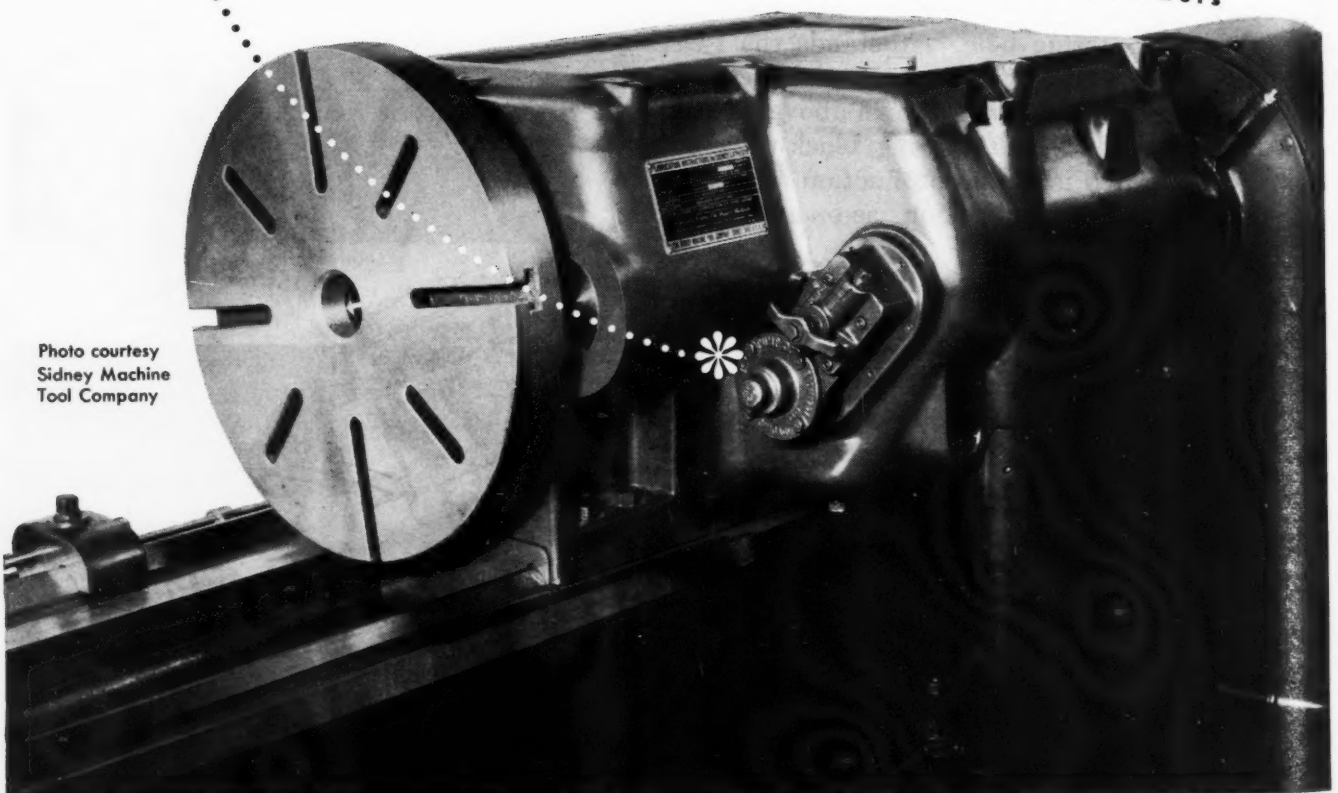


Photo courtesy
Sidney Machine
Tool Company





MEET OUR MR. QUINN!

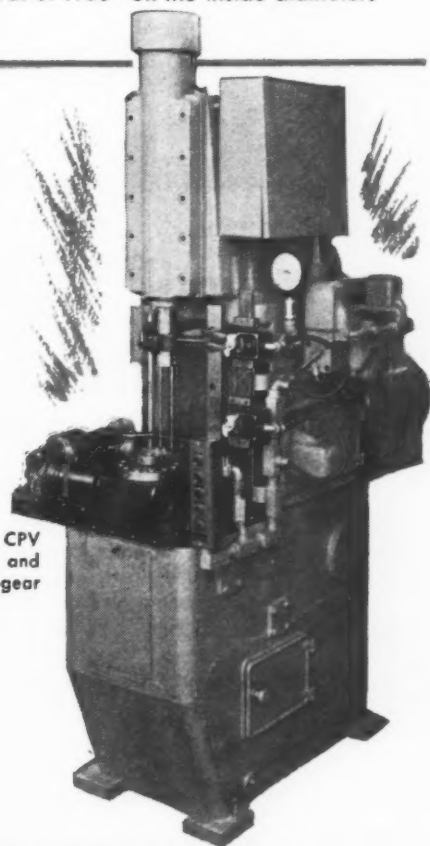
Automotive gear blank, broached at a rate of 1440 pieces per hour . . . with a stock removal of .100" on the inside diameter.

He doesn't look like a highly paid, skilled machinist . . . and he isn't! Even so, he—or any other unskilled operator—can broach these gear blanks at the astounding rate of 1440 pieces per hour. This machine is fully automatic, the operator merely loads and unloads blanks on the index head. It's as simple as A-B-C . . . and twice as fast!

Two internal 2-spline strip broaches of special design, overcome an inherent tendency to drift, and are equipped with a series of burnishing buttons near the rear blank to swedge the broached opening. This provides for easy retraction of the broaches and results in an improved finish.

How about you? Lapointe designed broaching equipment may well eliminate costly and complex machining operations in *your* plant . . . provide you with that all-important low cost "plus factor" with which to meet and beat all competition. Ask Lapointe to survey your product and your plant—to prove to you that broaching, the Lapointe way, is Quicker, Cheaper . . . and BETTER!

Lapointe standard 6 ton 18" stroke CPV press, with automatically synchronized ram and index head, capable of broaching 11,320 gear blanks in eight hour day.



THE
Lapointe
MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

MACHINERY, September, 1946—271

FOR HEAVY STOCK REMOVAL



To settle all doubt -

MICROHONING CUTS CHIPS! MICROHONING IS METAL CUTTING!

These Are Microhoned Honing Chips—

Millions—Billions—of such small scale chips are cut by the many thousands of face contacting grits in an average 3 to 6 stone set of honing stones—all cutting at the same time. Combined—they can remove a lot of metal—up to .080" on diameter—in a relatively short time—or at rate of .006" to .008" per minute.

This means that high production now has a new method of short-cutting time cost by honing from the green bore—hardening—and finish honing—with elimination of intermediate bore machining operations.

It is economical in other ways. New additive treatments in Micromatic Honing Stones yield from 200% to 400% more bores per set of stones than was formerly possible.



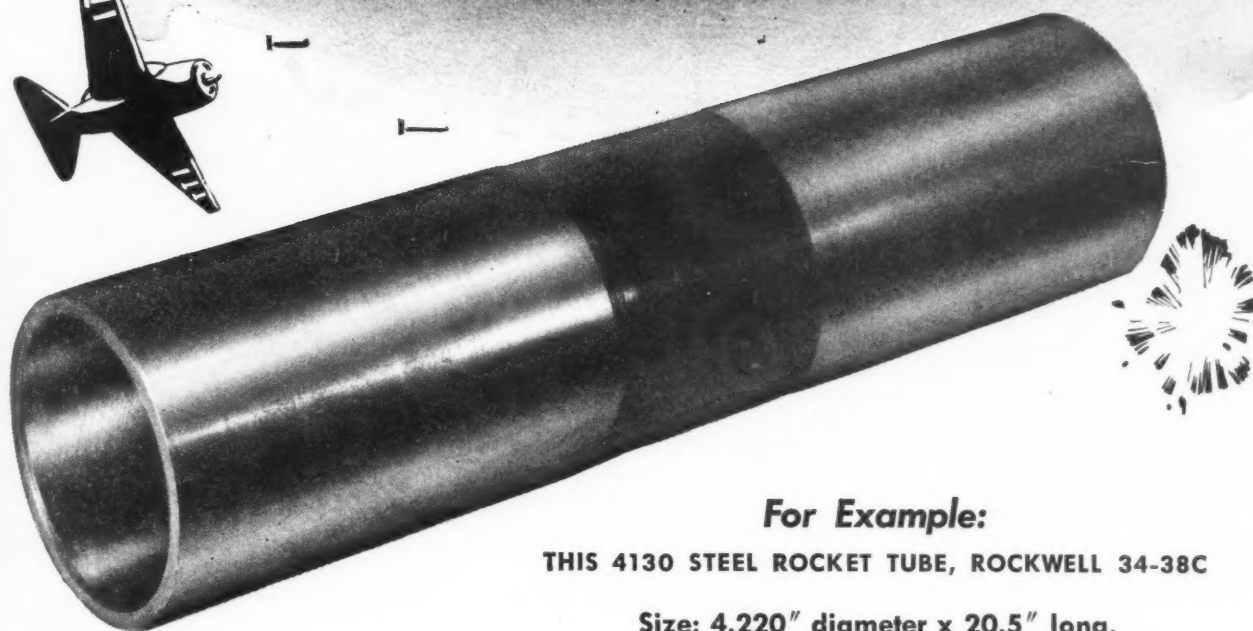
**HONING MACHINES, HONING TOOLS, HONING FIXTURES
AND HONING ABRASIVES**

MICROMATIC

DISTRICT FIELD OFFICES: 1323 S. Santa Fe, Los Angeles 21, California, Phone: Tucker 3756 • 194 Dalhousie St., Brantford, Ont., Canada, Phone: Brantford 1128 • 616 Empire Bldg., 206 So. Main St., Rockford, Ill., Phone: Forest 1128 • 501 Harries Bldg.,

MICROHONING

*is the Quicker,
Better, Lower Cost Method*



For Example:

THIS 4130 STEEL ROCKET TUBE, ROCKWELL 34-38C

Size: 4.220" diameter x 20.5" long.

Preceding Operation: Diamond Bore.

Average Stock Removed: .030" on diameter.

Average Time: 5.45 minutes

Average: 1.5 cubic inch per minute.

Average: .0055" on diameter per minute.



Another Example:

Aircraft Propeller Blade Tubing

Size: 8.000" diameter x 96" long.

**Preceding Operation: Drawn Seamless
Tubing with scale in bore.**

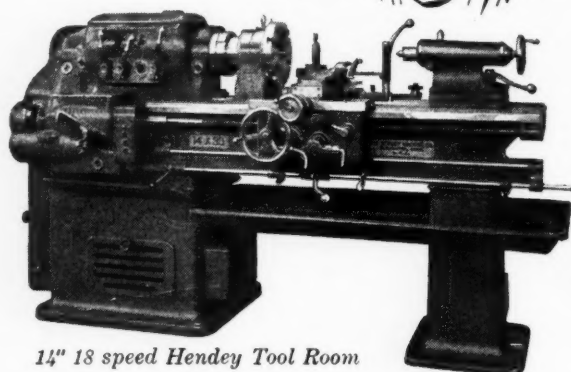
**Average Stock Removed: .050" to .080"
on diameter (approximately 156 cubic
inch in bore).**

Average Time Required: 65 minutes.

2063



HONE CORPORATION DETROIT 4, MICHIGAN

137 No. Main St., Dayton 2, Ohio, Phone: Hemlock 8261 • 927 A—M & M Bldg., P. O. Box 981, Houston 2, Texas, Phone: Preston 2381
• Room: 514—129 Church St., New Haven 10, Conn., Phone: New Haven 7-0035.



14" 18 speed Hendey Tool Room

Lathe with sub-headstock

This is the 4" dia. worm  that turned—so easily—when he met this nut . There was no fumbling, or feeling for fit, even though each had eight starts—even though tolerances were extremely close. This should have been a difficult manufacturing problem, but it wasn't—the worm and the nut were both produced on a Hendey Precision Tool Room Lathe with sub-headstock—produced the accurate Hendey way—achieving results that are easily explained when you study the design and construction of a Hendey Lathe. Design is functional—controls simple, strategically placed, lubrication of important units automatic. Construction specifications call for oil-hardened, shaved gears in headstock, super-precision bearings which completely eliminate chatter, standard commercial lead screw accurate to .001", close-grained special alloy lathe bed, testing of every part, assembly and finished machine—details that mean every Hendey Precision Tool Room Lathe will produce precisely for years—reasons why experienced machinists swear by Hendey.

Write today for complete details on the machine that made the worm turn—so easily.

The Hendey Machine Company

Hendey

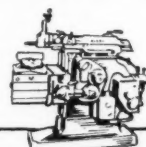
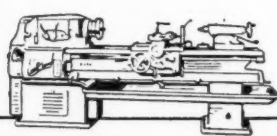
Main Office and Plant—Torrington, Connecticut

Branch Offices—New York, Chicago, Boston, Detroit, and Rochester

Representatives in—Phila., Cleveland, Los Angeles, Pittsburgh, San Francisco

TOOL ROOM LATHES

12" - 16" - 18"

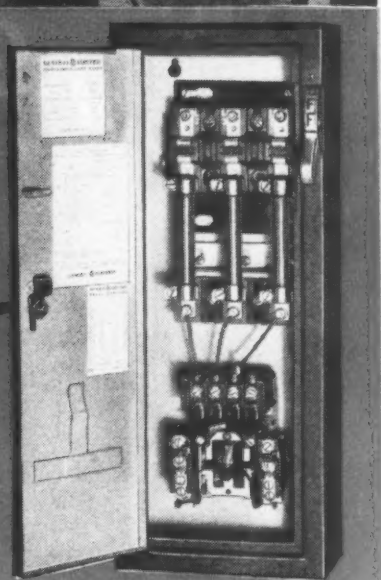


SHAPERS

12" - 16" - 20" - 24" - 28"



Sacking the seeds, one of the many processes controlled by G-E combination starters at the Rohnert plant



COMBINATION
STARTERS
SAVE TIME,
SPACE, AND MONEY

59

G-E COMBINATION STARTERS

Control the Processing of

1/4 of the World's Vegetable Seeds

Every process from eliminating dirt and debris to sorting the seed to size is controlled by G-E combination starters at the Waldo Rohnert Co., world's largest producers of garden vegetable seed.

In their four-story plant, completed in 1944, and said to be the most modern of its kind in the country, 1/4 of the world's garden vegetable seed is processed—that's far more than a million pounds of clean seed a year. All electrical, it boasts 59 General Electric CR7008 combination starters and supplementary control which regulate the five separate seed mills of their complicated seed mill system.

According to Fred Rohnert, son of the founder, "Our G-E con-

trols and equipment have proved extremely satisfactory. They've given us no trouble since their installation."

And here's why these starters have proved so satisfactory—

COMBINATION STARTERS SAVE TIME—

In addition to the time saved in ordering, outstanding savings in installation time are made with these starters. Users report a 50 per-cent reduction in mounting time, a 40 per-cent reduction in wiring time, as compared with the installation of two separate devices. You connect to only 9 terminals instead of 15.

SPACE—

Valuable wall space is saved be-

cause combination starters can be installed in small, unused places either near to or remote from the operator.

AND MONEY—

While the list price is slightly higher than for two separate devices, the difference is more than made up by savings in wire, fittings, and time.

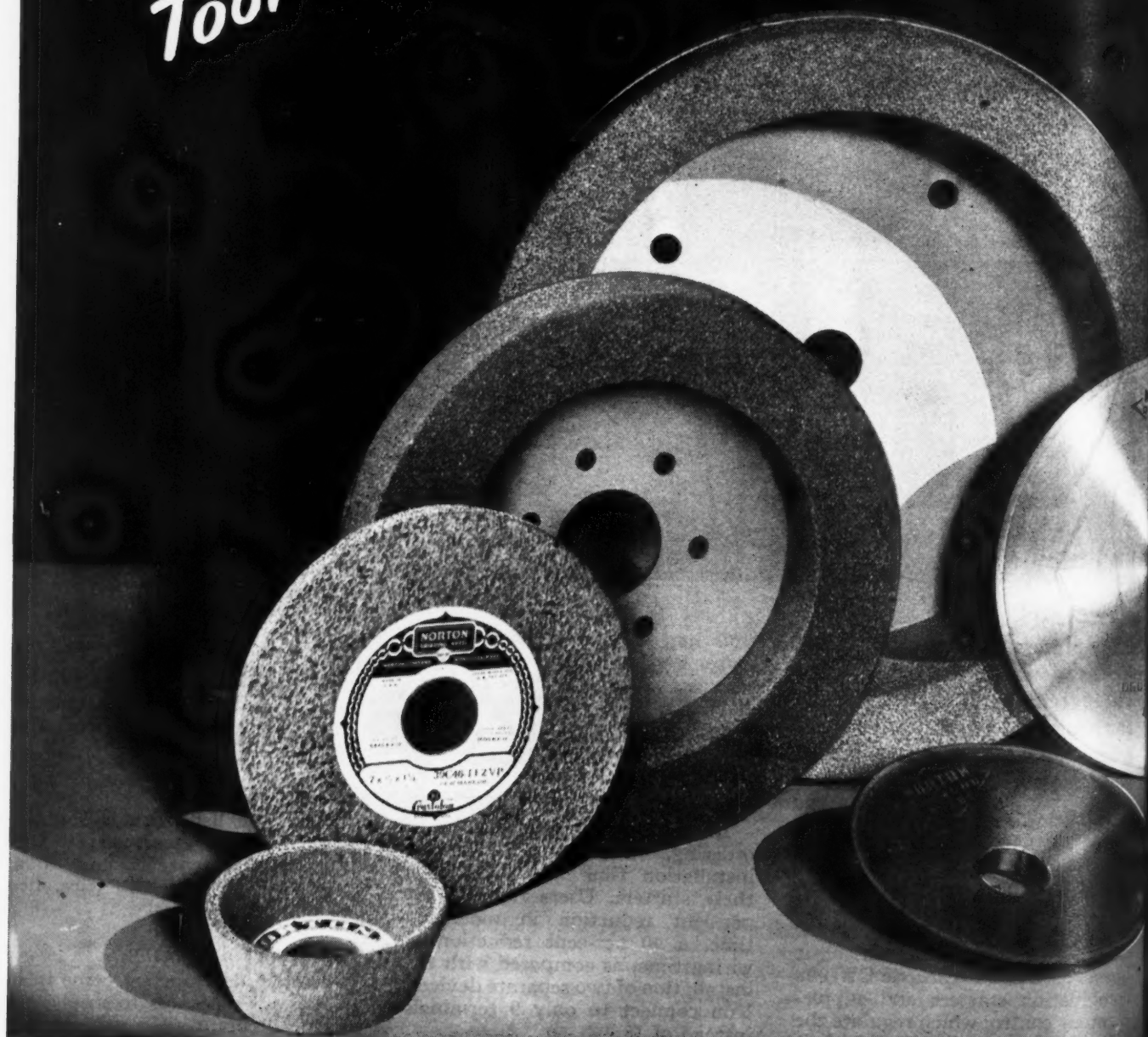
WHAT IS YOUR APPLICATION?

Combination starters come in a variety of enclosures to meet any operating condition in your plant. If you'd like more information, ask our nearest office for Bulletin GEA-2715A. And remember, our engineers will be glad to help you with your application. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

GENERAL  ELECTRIC

676-201-8910

*Have You Checked Up
Recently on Your Carbide
Tool Grinding Jobs?*



NORTON ABRASIVES

Should Your Diamond Wheels Be
Vitrified, Metal, or Resinoid Bonded?

Should Your Silicon Carbide (CRYSTOLON)
Wheels Be Regular or Open Structure?

FROM the Norton line of diamond wheels you can select the right bond for each of your carbide grinding jobs — cutting blanks, sharpening single-pointed tools, grinding chip breakers, sharpening multi-blade cutters. And there's a complete line of Crystolon wheels, too, for your grinders using silicon carbide wheels.

Norton has always been first in diamond wheels — first with resinoid bonded in 1934, first with metal bonded in 1939 and first with vitrified bonded in 1944. There's a definite field for each of these three types — and for Crystolon wheels.

Your Norton abrasive engineer or your Norton distributor's abrasive specialist will be glad to help select the most suitable wheel for each of your carbide grinding jobs.

NORTON COMPANY, Worcester 6, Mass.

Distributors in All Principal Cities

W-1068

Norton Diamond or
Crystolon Wheels
are Available for
All Makes of Car-
bide Tool Grinders,
including:

**Baldor
Blount
Norton
Bura-way
Carboloy
Criterion
Delta
Ex-cell-o
Hager
Hammond
Heald
Lee
Oliver
Prosser
Sundstrand
Willey**

Also for All Makes
of Tool and Cutter
Grinders.

There are Norton
metal bonded dia-
mond saws and vitri-
fied, resinoid and
metal bonded dia-
mond wheels for
glass, quartz and
stone.

NORTON ABRASIVES

T. M. Reg. U. S. Pat. Off.

Today, in Many Plants...

these 3 ways may be the Only Ways

to **REDUCE**

ASSEMBLY COSTS



1 American Phillips Speed: Time-savings as high as 50% come directly from greater ease of handling, faster starting, and faster driving with power drivers.



2 American Phillips Accuracy: Screw and 4-winged driver fit together into a single, solid unit that *can't drive any way but straight*. Screws turn up tight and flush every time. No scars on work-surface. No burred screwheads.



3 American Phillips Mastery of Metals: American's Engineering Research Laboratory gives you extra savings that stem from recommending the right type of screw in the *right metal for the job*...not only steel, brass and bronze, but also stainless steels, aluminum, monel, everdur. Bring your fastening problem here to the "Information Center"...where you may well find savings far beyond any you thought you could make.



4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND
Chicago 11: 589 E. Illinois Street Detroit 2: 502 Stephenson Building

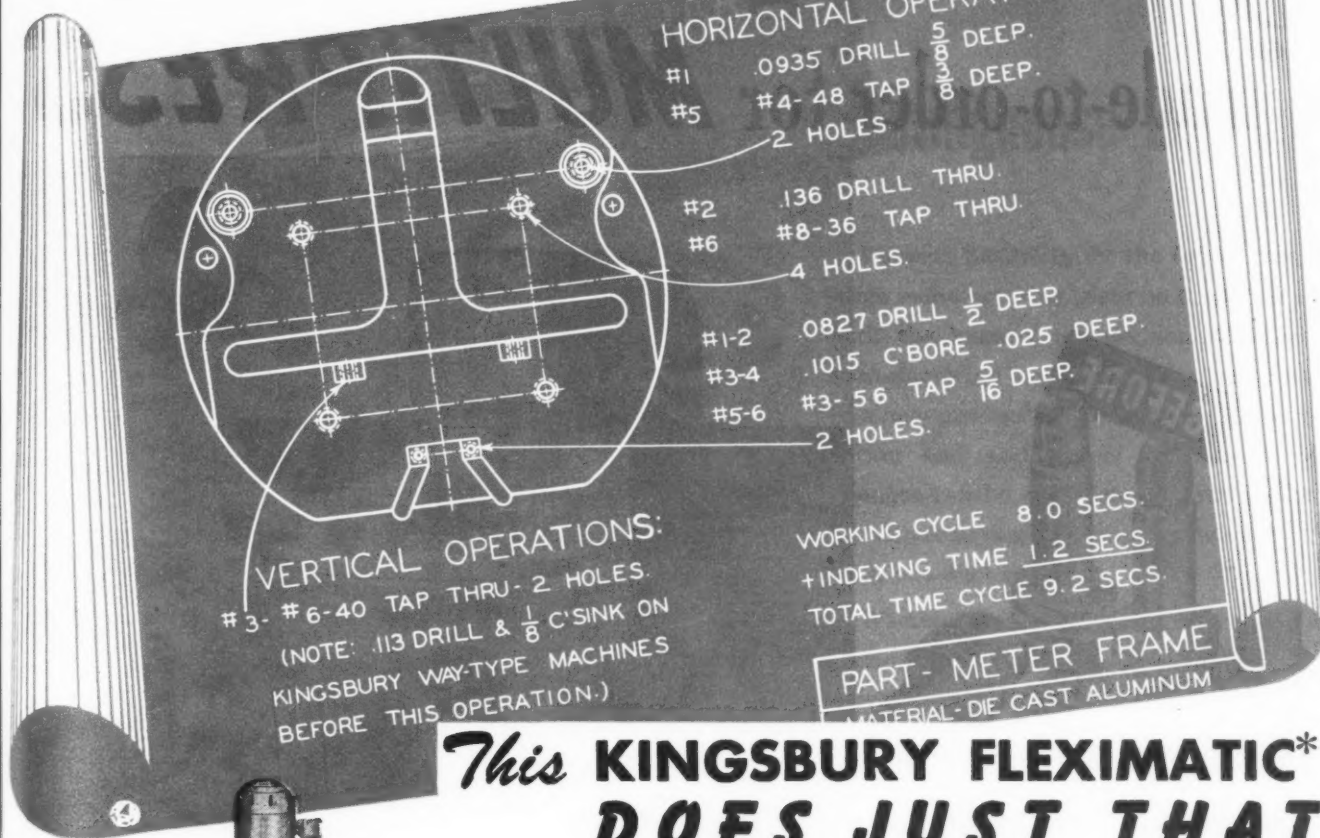
Cut your costs in these 3 ways, with:

AMERICAN PHILLIPS *Screws*

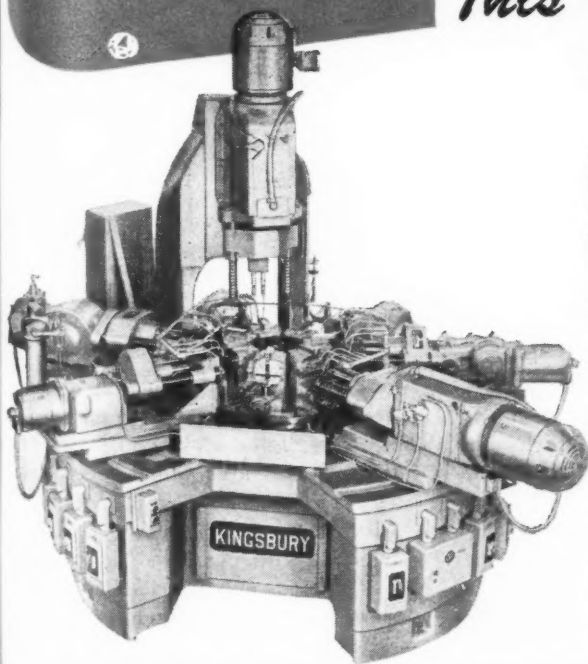


ALL TYPES
ALL METALS: Steel, Brass, Commercial Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

COMPLETE TWENTY OPERATIONS IN 9.2 SECONDS?...



This **KINGSBURY FLEXIMATIC*** **DOES JUST THAT**



In one chucking this Kingsbury Fleximatic automatically drills, taps, and counterbores a meter frame as shown in the sketch. Each part is chucked in one of seven identical work holders on the indexing turret. As soon as the turret has indexed and locked, the seven automatic head units start their work cycle. While they are operating on six parts, the operator removes the completed piece from the seventh work holder and replaces it with a new part. Thus, the time to complete each piece is the time for the longest single operation plus the brief indexing interval.

Because the base, the indexing turret, and the head units are all standard Kingsbury equipment, the initial cost is far lower than the usual special purpose machine. This unit construction also simplifies the problem of adapting a Fleximatic to a change in design of the part.

Kingsbury Fleximatics have reduced the machining cost of hundreds of different parts requiring multiple operations up to an inch or more in diameter. Send us samples and prints of your high production jobs specifying the operations and production desired and also the locating point. We shall make proposals without obligation.

* **KINGSBURY FLEXIMATIC**

— a special purpose machine for combined automatic operations during a single chucking
 — the result of Kingsbury engineering ability in the use of low cost standard Kingsbury drilling and tapping heads on standard Kingsbury bases.

KINGSBURY

KINGSBURY

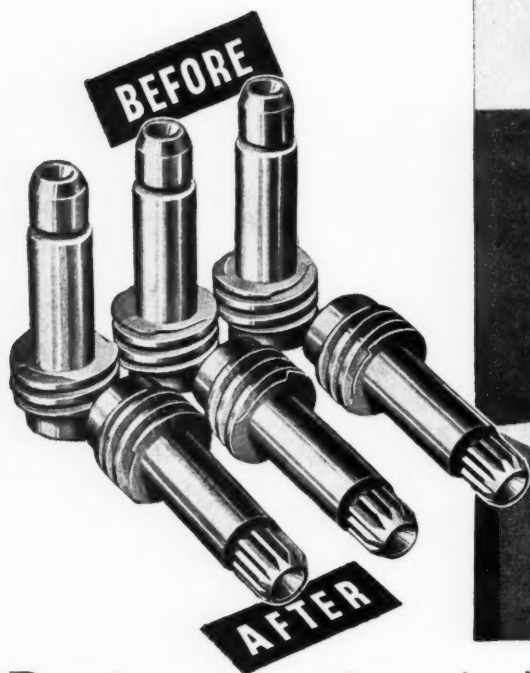
MACHINE TOOL CORP.

KEENE, NEW HAMPSHIRE



Write for Bulletin E

Broaching—another application “made-to-order” for **MULTIPRESS**



*Putting serrations in brass valve-stems
proves the efficiency of **MULTIPRESS***

“One stroke” broaching of the brass plumbing-fixture parts like those illustrated above is easy and economical when you use MULTIPRESS equipped with a standard Denison Index Table. The valve-stems are loaded into specially constructed dies by the operator and are *automatically* moved to the broaching position, broached, and unloaded from the die.

This broaching operation calls for a rather heavy “bite”—but with MULTIPRESS, you can *pre-regulate* the power

load so that neither press nor tooling is endangered if the cutting die meets an off-dimension part. The pressure load is not applied like a hammer blow. Instead, you obtain a smooth *flow* of power and speed—*uniform* velocity of the broaching tool that avoids fractures and strains in the broached pieces, reduces tool wear and damage. Pressure, speed of operation, and stroke length are easily and quickly regulated. And you are not limited to broaching operations alone!

Your basic MULTIPRESS unit is a com-

plete and remarkably compact, hydraulic press adaptable to many different operations. Use of the six-station hydraulic index table assures added speed and safety in feeding materials into the press.

MULTIPRESS is built in 4, 6 and 8-ton capacities, with manual or automatic controls—a size and model for every job. A wide assortment of standard accessories adapt it to a broad range of industrial applications. Write for complete MULTIPRESS details or for recommendations on your own requirements.

THE DENISON
ENGINEERING COMPANY

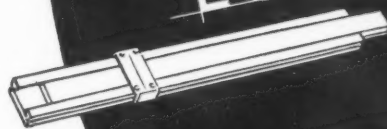


DENISON
EQUIPMENT *for* APPLIED
Hydraulics

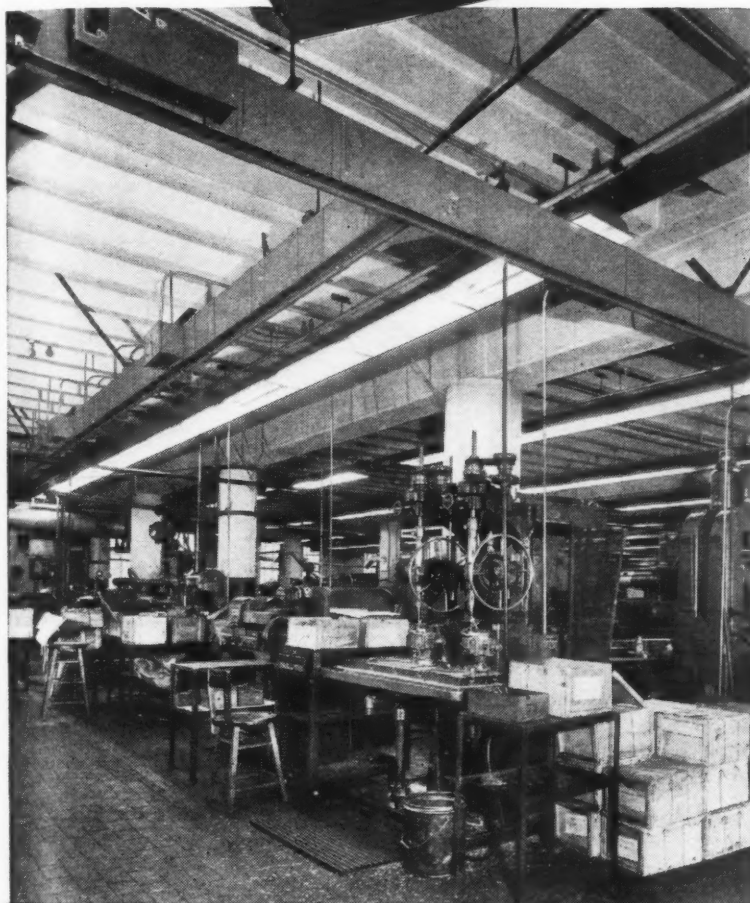
1152 DUBLIN ROAD
COLUMBUS 16, OHIO

this is

PLANNED
ECONOMY



with Westinghouse Bus Duct



Planned flexibility for the future puts this large manufacturing plant on a fighting basis with the keenest competition. Changes in manufacturing technique or the manufacture of a new product may call for extensive relocation and addition of machinery. Such changes can be met faster... with less work... with resulting economy if power is carried by a bus duct system.

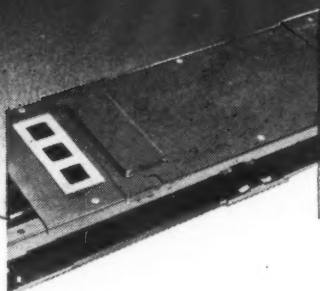
Westinghouse Bus Duct comes in ten-foot sections and requires only wrench, screw driver and block and tackle for its installation. An exclusive Westinghouse feature is a cantilever hanger which slides to position, making it unnecessary to line up a fixed hanger with a fixed support overhead.

There's a plug-in opening every twelve inches, alternating from side to side. Plug-in openings are insulated with Prestite, which also insulates and supports the busbars. Prestite is an exclusive Westinghouse product... a wet process porcelain of high dielectric and mechanical strength. Exclusive four-channel housing design makes Westinghouse the strongest of all bus duct construction.

Put your bus duct problems up to Westinghouse Bus Duct Engineers. Call your nearest Westinghouse distributor, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60636

OPENINGS EASILY ACCESSIBLE

—Spring-held access covers slide aside easily for access to Prestite-insulated plug-in opening. Cover remains on bus duct.



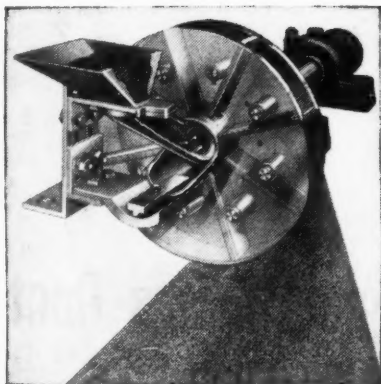
Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE



BUS DUCT

Ask your Westinghouse Distributor, or write for your copy of Booklet B-3714. It gives you complete information for applying bus duct to your power distribution job.





Simplifies Production...

Lake Erie Hydraulic Press eliminates heating, welding and many other steps in the manufacture of the Wheelabrator Airless Blast Unit shown at left.

A PRACTICAL example of the way modern hydraulic presses streamline production is provided by the American Foundry Equipment Co. of Mishawaka, Indiana. Here, in the words of that company, are the production economies that resulted when they installed the 1000-Ton Lake Erie Hydraulic Press illustrated.



"The two circular side plates used on our Airless Wheelabrator Blast Unit are now straightened cold in the Lake Erie press... they formerly had to be heated before straightening.

The spacers used to separate the side plates are now riveted in place in the Lake Erie press... this operation used to be handled by hole welding.

We are now braking circular deflectors and liners... these parts used to be rolled in a bending roll.

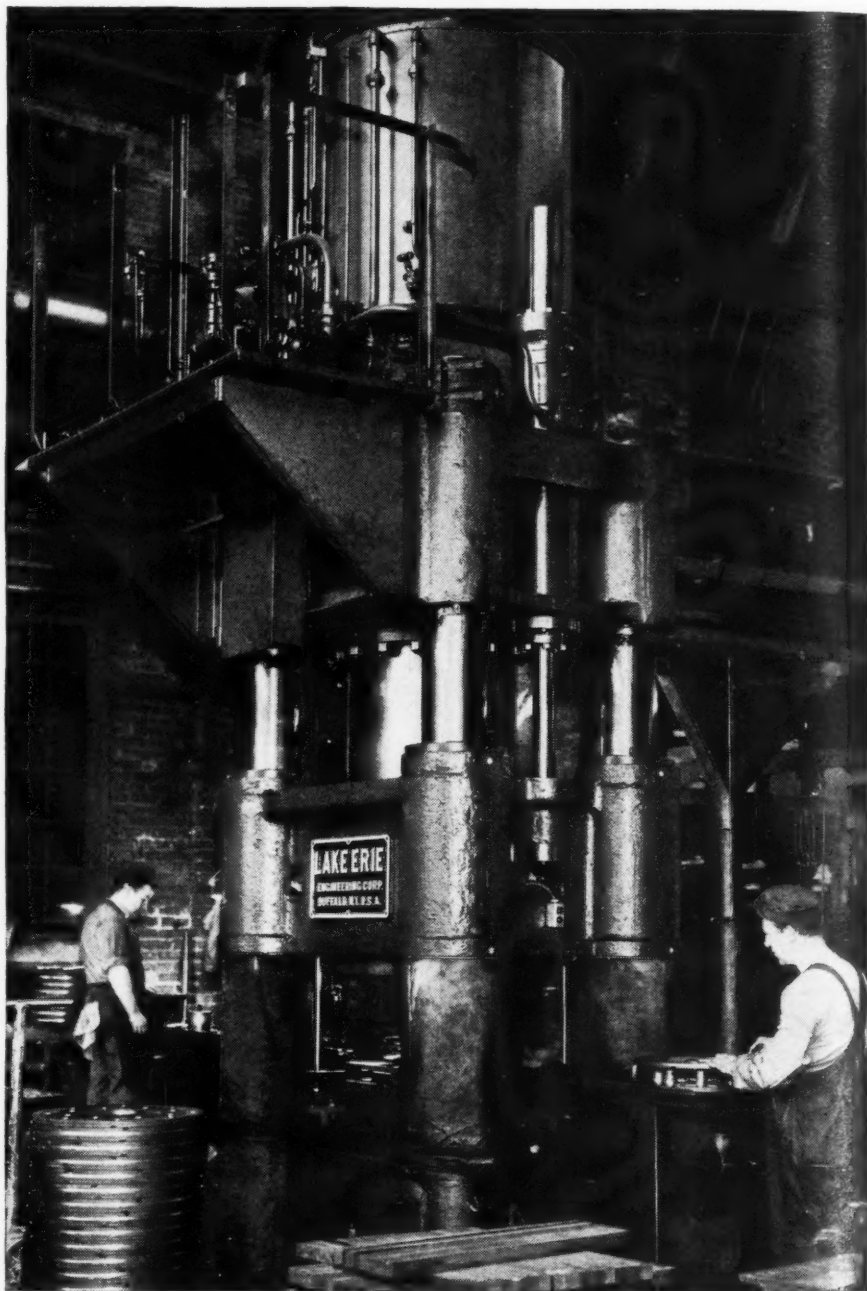
The flights on the endless conveyor which forms the cleaning chamber of our 27"x36" Wheelabrator Tumblast are now formed completely in the Lake Erie press... to get the shape desired on this flight we used to weld a 1-inch half-round bar the full length of the flight.

We are now straightening numerous castings cold in the Lake Erie press that formerly had to be heated and straightened in our blacksmith shop.

Reinforcement bars for the endless belt conveyor used on our 48"x42" and 48"x72" Wheelabrator Tumblasts are being made in the Lake Erie press... it formerly took three operations to do this on an ordinary press brake."



Lake Erie Engineers, through their day-to-day contacts with leading manufacturers, have valuable information about methods for improving product quality and plant efficiency with hydraulic presses. This practical experience is available to you for the asking. Consult Lake Erie's Engineers today or write for latest Bulletins on hydraulic presses. No obligation, of course.



LAKE ERIE
ENGINEERING CORPORATION
170 Woodward Avenue, Buffalo 17, N. Y.

Offices in Principal Cities and Foreign Countries

Leading manufacturer of hydraulic presses —all sizes and types—metal working... plastic molding... processing... rubber vulcanizing... stereotyping... special purpose.

HOW TO GET *Efficient* HYDRAULIC POWER FROM A 6-POUND SPUR GEAR PUMP

... even at 1000 psi

FOR APPLICATIONS LIKE THESE:

Materials handling equipment ... farm machinery ... machine tools ... oil-well sampling ... remote valve control ... power transmission ... and low-capacity, high-pressure circulating and delivery functions.

Pump shown
approximately $\frac{3}{8}$ size

SPECIFY McINTYRE SERIES 700 HIGH-PRESSURE POWER PUMPS

Delivering from .4 gpm at 200 rpm to 9.6 gpm at 1750 rpm against pressures up to 1000 psi, McIntyre Series 700 Precision Pumps offer you the benefits of a minimum tested volumetric efficiency of 90% and an average mechanical efficiency of 80% ... ratings just recently made possible in pumps of this type.

McINTYRE PRECISION DOES IT

McIntyre mass-production machining methods are capable of making surfaces flat to one light band and holding vital dimensions to toolroom tolerances of tenths and split tenths.

That's why the close fit of the aluminum body castings and nitrided nitralloy gears of these pumps keep slippage and wear at a minimum. And that's why more and more firms are specifying pumps and fluid motors carrying the red McIntyre Light-Band Trade-Mark.

WRITE FOR COMPLETE DATA

Whatever your possible use for McIntyre Series 700 High-Pressure Pumps—for hydraulic power, pressure lubrication, or low-capacity circulation or transfer applications—you'll want to study all the facts. Write for them today. The McIntyre Co., 200 Riverdale Avenue, Newton 58, Mass. ... also makers of precision spur gears to your specifications.

THE McINTYRE co.
PUMPS AND FLUID MOTORS

THE ULTIMATE IN PRECISION

IDENTIFIED BY THE LIGHT BAND

THERE'S *More* THAN MUSIC IN THE AIR!



THERE'S MUSIC IN THE AIR...
stirring music by military bands. Compressed air "plays" all the wind instruments in the band, with each musician acting as his own "air compressor."

THERE'S POWER IN THE AIR... compressed air power for driving a Continental Divide tunnel...for carving out the foundation of a mighty hydroelectric power dam...for mining the metals that make modern civilization possible. Compressed air multiplies man's power many times over for mining, tunneling or construction job. Air tools speed production in almost every industry.

THERE'S FIRE IN THE AIR... the blaze of a million furnaces smelting the ore...melting and heating-treating the metals... firing the clay...doing the thousand-and-one jobs of industry where heat is required. Turbo-blowers breathe life into those furnaces by supplying the air they need for combustion.

THERE'S FUTURE IN THE AIR... many thousands of applications for compressed air are already in use—many more will be found. Think of your problems in terms of air. Consult with Ingersoll-Rand when you have a job where air might be used...for more than 70 years we have made compressed air machinery our business.



**AIR TOOLS
COMPRESSORS
CONDENSERS
ROCK DRILLS
TURBO BLOWERS
CENTRIFUGAL PUMPS
OIL & GAS ENGINES**

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

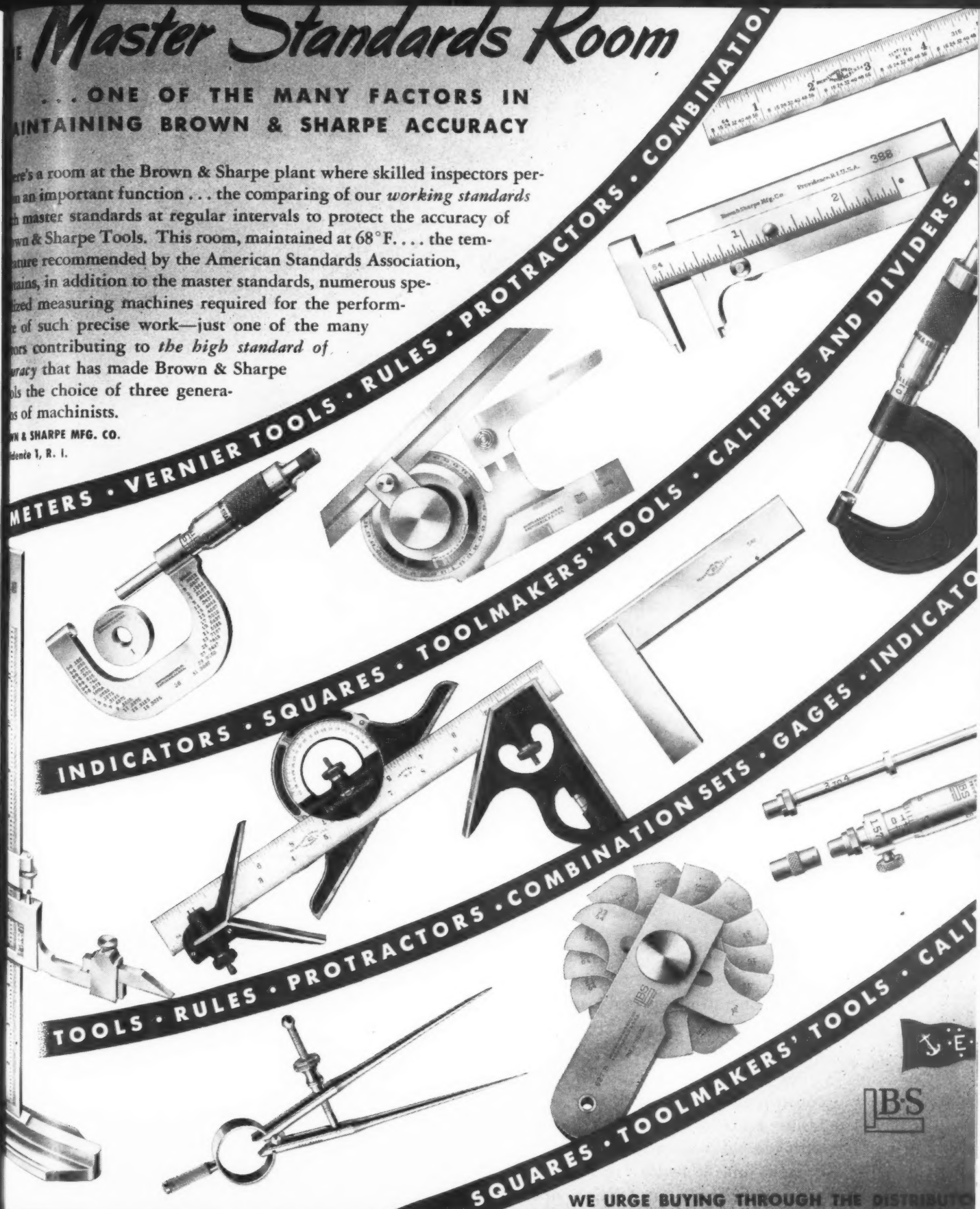
14-B66

Master Standards Room

... ONE OF THE MANY FACTORS IN
MAINTAINING BROWN & SHARPE ACCURACY

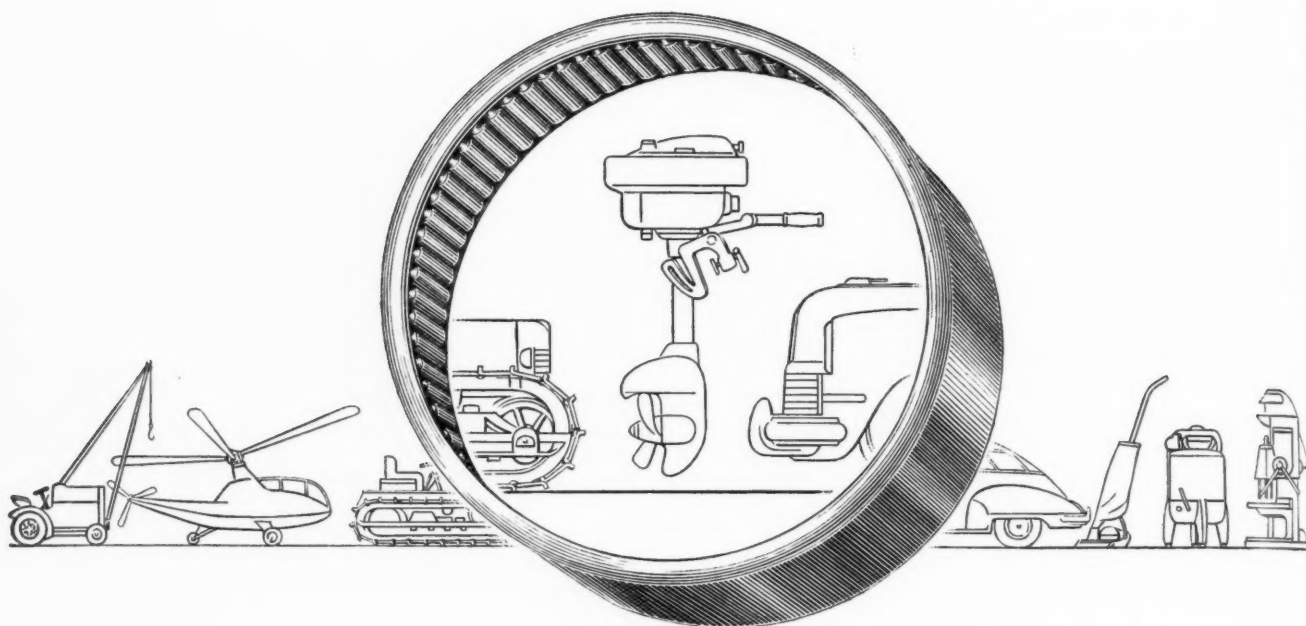
There's a room at the Brown & Sharpe plant where skilled inspectors perform an important function... the comparing of our *working standards* with master standards at regular intervals to protect the accuracy of Brown & Sharpe Tools. This room, maintained at 68°F... the temperature recommended by the American Standards Association, contains, in addition to the master standards, numerous specialized measuring machines required for the performance of such precise work—just one of the many factors contributing to the *high standard of accuracy* that has made Brown & Sharpe the choice of three generations of machinists.

BROWN & SHARPE MFG. CO.
Rochester 1, N. Y.



WE URGE BUYING THROUGH THE DISTRIBUTOR

BROWN & SHARPE TOOLS



Here is another way to make your product stand out!

Yes, many diversified products stand out among their types—in terms of compact design, operating efficiency, maintenance economy and service life—through the use of Torrington Needle Bearings.

For these compact units allow *sturdier* construction with *simpler* housings... assure *maximum* efficiency of operation with *minimum* attention... pack a *higher* capacity into a *smaller* relative O.D.... provide *valuable* anti-friction operation at *low* initial cost.

If your problem is one of making your

product *stand out* with little change in design and minimum re-tooling, or securing the advantages of anti-friction operation with lower costs all along the line, write for our latest Needle Bearing Catalog No. 32. Our engineering department will welcome the privilege of working with you in the layout or application of any problem regarding the use of Needle Bearings in *your* product.

THE TORRINGTON COMPANY
TORRINGTON, CONN. SOUTH BEND 21, IND.
Offices in All Principal Cities

TORRINGTON NEEDLE BEARINGS

JUST AN ORDINARY JOB

BUT A COSTLY ONE WHEN NOT EFFICIENTLY PROCESSED . . .

● Why not consider a simple NATCO way-type machine, as illustrated, to solve your "hole cost" problem? The machine shown here is a NATCO 3-way, built of three standard self-contained HOLEUNITS provided with a total of 24 spindles. The operations performed are chamfering and spotfacing on three sides of automotive Flywheel Housings.

● NATCO HOLEUNITS are flexible and interchangeable, and can be mounted at any angle. They are built in a number of different sizes, depending on the work, for continuous high production Drilling, Boring, Tapping and kindred operations.

● This is another example of NATCO engineering ability in building high production equipment. Call a NATCO representative, let him analyze your "hole" troubles and solve your "hole" problems with the backing of NATCO's "KNOW HOW," developed by many years of experience in the building of high production Drilling, Boring and Tapping machines.



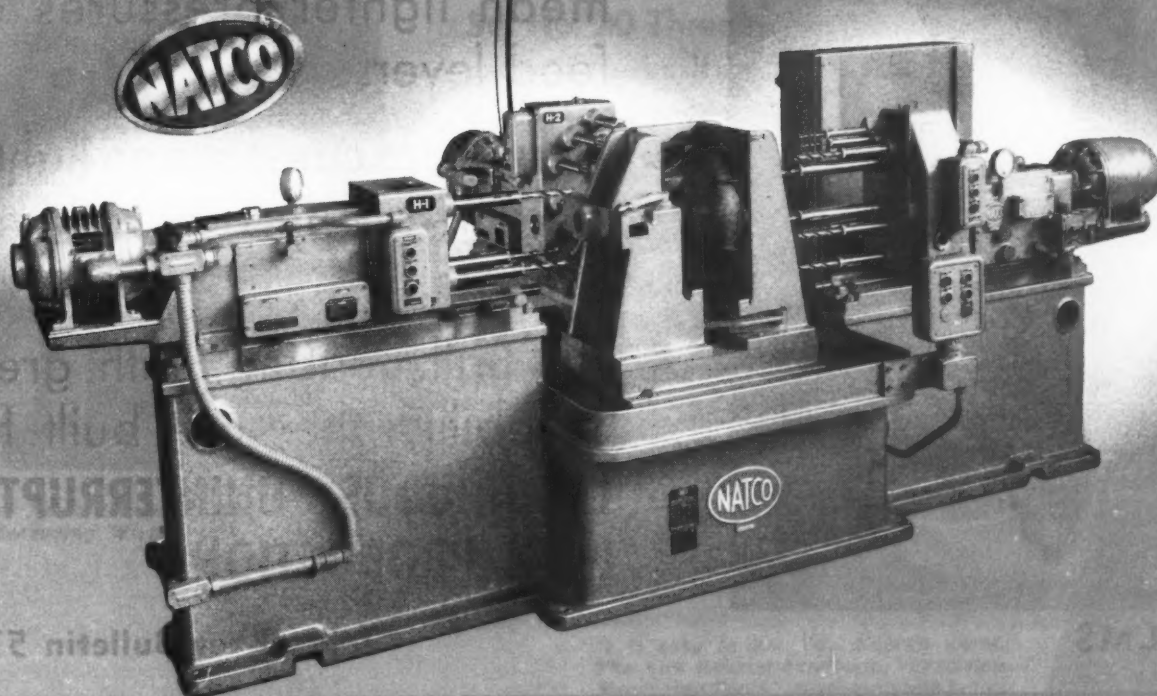
REAR HEAD-FACE "A"
Countersink 8 holes



LEFT HAND HEAD-FACE "C"
Countersink 4 holes



RIGHT HAND HEAD-FACE "B"
Countersink 8 holes
Combination spotface
and Countersink 1 hole



NATIONAL AUTOMATIC TOOL COMPANY, INC.

RICHMOND, INDIANA, U.S.A.

MULTIPLE DRILLING, BORING AND TAPPING MACHINES

SALES OFFICES: 1809 ENGINEERING BUILDING, CHICAGO; 409 NEW CENTER BUILDING, DETROIT;
1807 ELMWOOD AVENUE, BUFFALO; 2902 COMMERCE BUILDING, NEW YORK CITY

THE No. 1 and No. 2

Friction Tapping Attachments

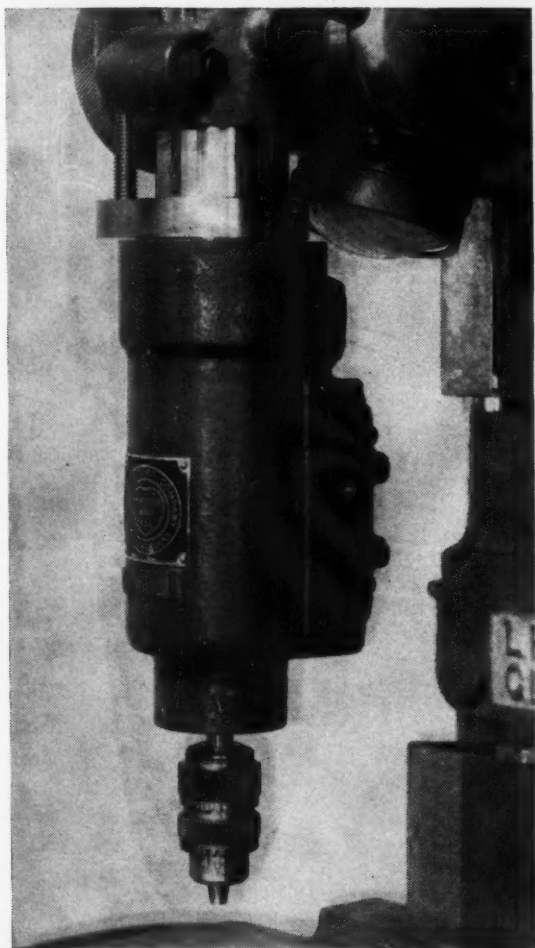
FOR USE ON

LELAND-GIFFORD

No. 1 LMS and No. 2 LMS

DRILLING MACHINES

WILL OPERATE AT ANY SPEED THAT HIGH
SPEED, GROUND THREAD TAPS WILL STAND



No. 1 LMS

- Rigidly clamped to spindle to prevent rotation and pulling out from taper.
- Generous areas of frictions mean lighter pressures on feed lever.
- Aluminum cases mean lighter weight and increased sensitivity.
- Full Ball Bearing, with great durability, they are built for **CONTINUOUS, UNINTERRUPTED HIGH PRODUCTION**

Send for Bulletin 510A

LELAND-GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

Van Keuren

MEASURING WIRES

STANDARD EQUIPMENT

Everywhere



Measuring the pitch diameter of a 1"-8 National Form thread gage with three wires. This method is recommended by the Bureau of Standards.

Van Keuren Measuring Wires are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, worms, splines and gears.

Reputable manufacturers of the ground taps and thread gages used for the production and acceptance of threaded holes and nuts use Van Keuren Measuring Wires. You will seldom find them in error if you, too, have Van Keuren Measuring Wires.

Set No. 20 Thread Measuring Wires is a plant necessity for maintaining taps and thread gages within their limits for wear and for proving the pitch diameter of screws and threaded male parts. Price, High Speed Steel Wires \$95.00 Price, Carboloy Wires \$240.00 Special wires from .002" to 1.510" diameter—prices on application.



Set No. 20 Thread Measuring Wires.

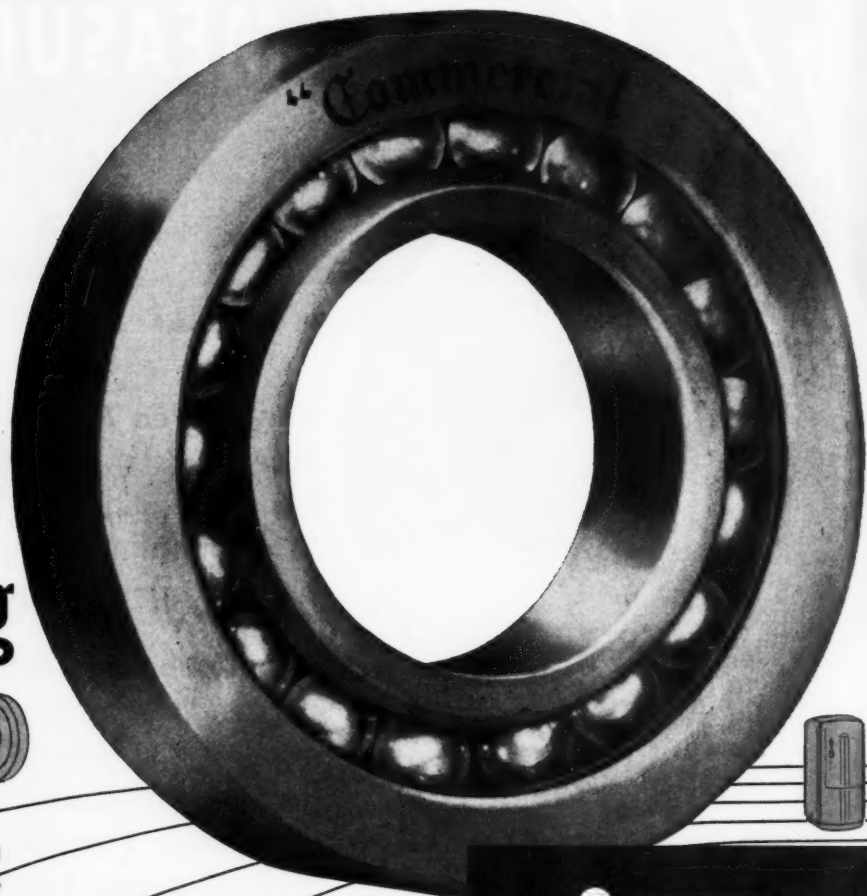
It is easy to use Van Keuren wires. The Van Keuren handbook, "Precision Measuring Tools," gives complete tables and simplified formulas for measuring standard and special threads, splines, gears and worms. Send for this valuable 160-page handbook No. 33.



THE Van Keuren

27th YEAR

The low-cost multi-purpose ball bearing



SCHATZ
"Commercial"
BALL BEARINGS

You write "rugged" into your blueprints—at low-cost—when you make Schatz "Commercial" Ball Bearings part of your design. For, unlike other moderate-priced bearings, "Commercials" combine *through-hardened* chrome alloy balls with high-grade, low-carbon, cold-rolled steel rings.

Long bearing life is equal to the sum of these parts...and extra-utility, too. So it's not unusual to find "Commercials" rolling along in all kinds of service, delivering efficient, friction-free operation in stamping presses and lawn mowers, or in riveting machines and refrigerators.

Compare their on-the-job performance with other low-cost ball bearings. And consider, too, the plus value of Schatz engineering counsel while your application is in the 290—MACHINERY, September, 1946

design stage. A fifty year fund of ball bearing "know-how" is at your disposal.

Schatz "Commercials" are manufactured in all standard types and sizes to cover the wide range of ball-bearing applications where moderate cost is a vital factor alongside of maximum efficiency. The answer to your anti-friction problem is among them.

Remember, Schatz makes only ball bearings, and "Commercials" are manufactured only by Schatz.

THE SCHATZ MANUFACTURING COMPANY
POUGHKEEPSIE, NEW YORK
REPRESENTATIVES LOCATED AT

Detroit: 2640 Book Tower-26 • Cleveland: 402 Swetland Building-15
Chicago: 8 S. Michigan Ave.-3 • Los Angeles: 5410 Wilshire Blvd.-36

Special Tools are Costly



Call Your DISTRIBUTOR!

Leading distributors in every section of the country have complete stocks of National Cutting Tools. Every National distributor has a factory trained man to serve you. Call your National distributor for cutting tools or any staple industrial product.

Often the "special" metal cutting tool you require differs so little from a standard tool that it pays to check your NATIONAL catalog first. Whenever you can use a standard size tool, as listed in the catalog, you can reduce your cutting tool costs.

Whether you require standard or special sizes, you can be sure of getting the right tool for each metal cutting job when you specify NATIONAL Tools.

NATIONAL

TWIST DRILL AND TOOL COMPANY

ROCHESTER, MICH., U.S.A.

Tap and Die Division - Winstar Steel Co.



TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS
END MILLS

*You Wouldn't
or Would You?*



**Use a Chip Driver or Spiral
Pointed Tap in a blind hole?**

**A Cut Thread Tap for close
precision threaded holes?**

**Carbon Steel Taps for tap-
ping moulded plastics?**


**Attempt to tap tough, cold
worked metals dry?**


These and many other questions much more complex are being answered every day by Winter Brothers engineers. 46 years in the thread cutting field has equipped the Winter Brothers staff with a wide experience of tapping problems. Hundreds of case histories carefully recorded and filed for future reference, of threading problems successfully solved, give our engineers a unique background and particularly qualify them to solve your tapping problems.

The user of Winter Taps is entitled to

this service — just one of the PLUS services offered by Winter Brothers. For the quick solution of your threading problems contact your local distributor handling Winter Taps. He has within his reach the complete resources and research facilities of the Winter Brothers Company.

**You get low cost production
when you use Winter Taps. Spec-
ify them — always! Immediate
delivery from distributor and
factory stocks of catalog listed
items.**

Winter Brothers
COMPANY  Wrentham, Massachusetts, U.S.A.
BRANCH STORES: SAN FRANCISCO, CALIFORNIA - CHICAGO, ILLINOIS - DETROIT, MICHIGAN
A DIVISION OF THE NATIONAL TWIST DRILL & TOOL CO., ROCHESTER, MICHIGAN



**dynamic
balancing**

**makes
every
GUSHER COOLANT PUMP
better!**

All rotating parts of all Gusher Coolant Pumps are now dynamically balanced by means of the dynetric process.

Now we've made Gusher Coolant Pumps even better! By dynamically balancing all rotating parts we have made Gushers operate with even greater smoothness and dependability.

Today's "split tenth" standards of precision demand super-accurate machines, and these machines must be free from vibration from any source in order to turn out their best work. You'll get no work-spoiling vibration from a dynamically balanced Gusher Coolant Pump!

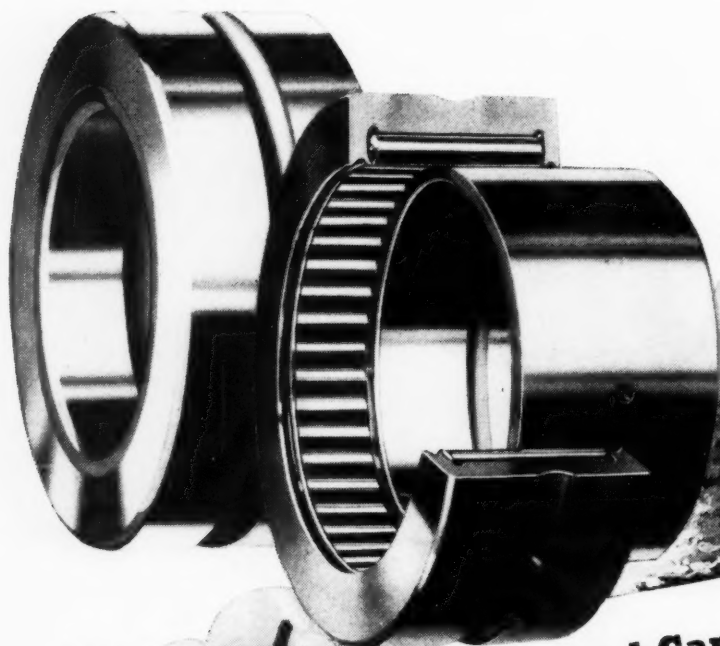
Dynamic balancing, plus other Gusher features, means longer trouble-free service as well as smooth operation. Features like their full ball-bearing construction . . . rugged, one-piece shaft . . . non-clogging construction, with no metal-to-metal contacts in the impeller . . . all contribute to dependable operation. And Gusher Pumps have still another important feature: they start instantly, without priming, and can be throttled to any extent without building up pressure.

For smooth operation . . . for economical, service-free performance . . . equip your machines with dynamically balanced Gusher Coolant Pumps. Sizes and types for every application. The Ruthman Machinery Company, 1807-1823 Reading Road, Cincinnati 2, Ohio.



THE COOLANT
Heart
FOR A GOOD
MACHINE

GUSHER COOLANT PUMPS



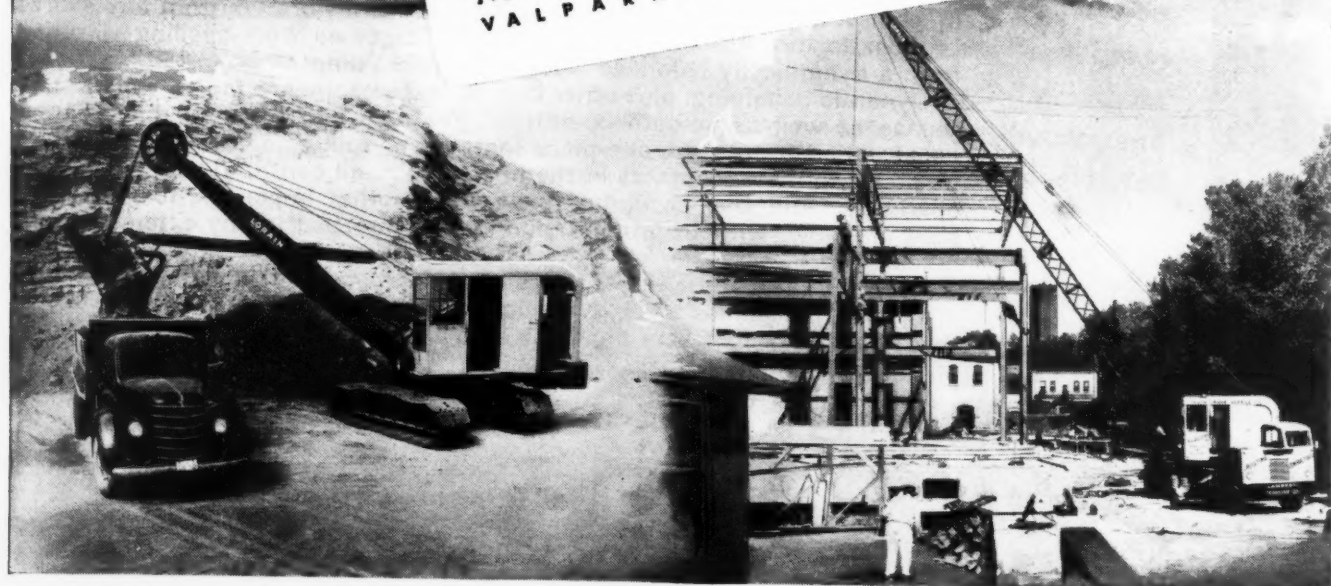
Greater Load Capacity with McGILL SOLIDEND MULTIROL Bearings

The full length, rounded end rollers, used in the "Solidend" Multirol Bearing, increase the contact surface between race and rollers. This gives the McGill Bearing a greater load capacity and a longer, trouble-free life. The solid retaining end shoulders built integral with the outer race eliminate flimsy end washers and loose retaining rings. As a result "Solidend" Multirol Bearings can be used with or without the inner raceway.

An application of these bearings is in the Boom Hoist mechanism of Thew-Lorain Moto-Cranes and Crawler Mounted Machines.

For further information write for catalog SM-42.

McGILL MANUFACTURING CO., INC.
Manufacturers of Ball and Roller Bearings
VALPARAISO - INDIANA



FORMSPRAG

THE FULL COMPLEMENT

Over-Running Clutch

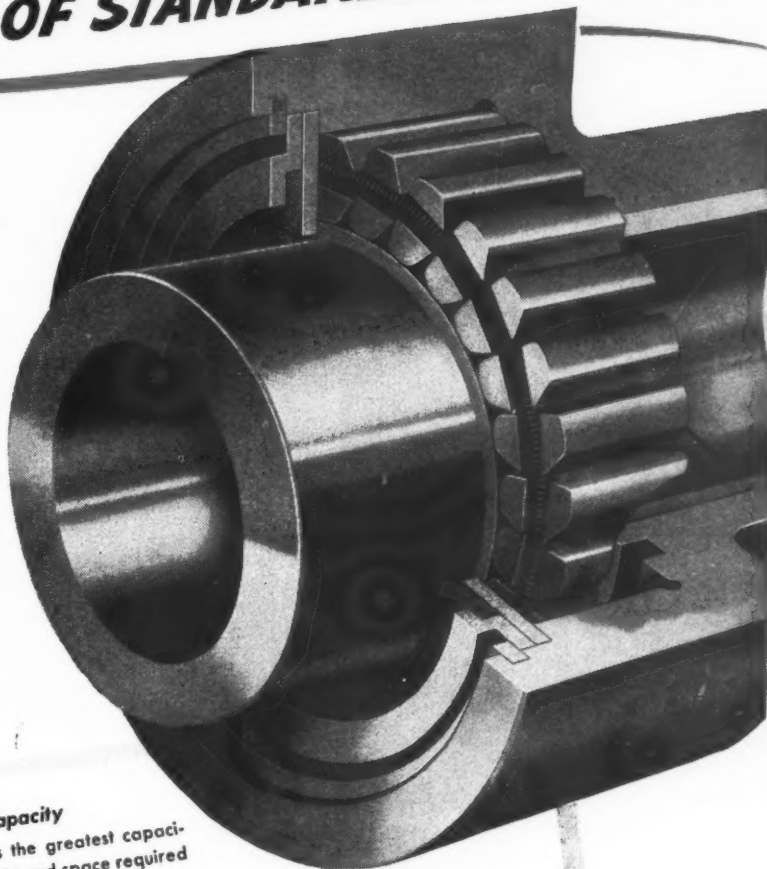
IN A WIDE RANGE OF STANDARDIZED SIZES

● Formsprag is now available in standardized sizes that meet most requirements of the designing engineer. These sizes cover a wide range in capacities. The plain bearing types, for instance, have torque capacities running from 240 to 123,000 inch pounds, and bores from $\frac{3}{8}$ " to 4".

The ball bearing clutch is also made in a wide range of sizes.

In Formsprag there is no lost motion, no backlash, no slipping. It overruns freely at the slightest reduction in the speed of the driving member, and engages smoothly and positively. Formsprag is enthusiastically endorsed by the manufacturers of bread wrapping machines, box making machines, spring coilers, canning machinery, punch press feeds, textile weaving machines, paper and rubber calendars, printing presses, dual power drives, dry cleaning equipment, machine tools and many other types of equipment.

The standardized line meets most requirements, but where special applications are necessary our engineers will gladly make recommendations.



SUPERIOR PERFORMANCE

The performance of FORMSPRAG, in widely diversified industries, offers testimony to Geargrind's sound engineering, precision manufacture and proper application.

Full Complement of Sprags

With the annular space between driving and driven members completely filled with sprags, there is no need for cages to position them. Torque load, therefore, is distributed over the greatest possible area. Longer life is the result.

High Torque Capacity

Formsprag offers the greatest capacities for size, weight and space required for installation.

Simple Construction

Cylindrical inner and outer races on which no localized wear can develop. No internal or external cams. No cages. End notches shaped to retain energizing spring and protect sprag gripping surfaces against concentrated end load. Easy installation.



The **GEAR GRINDING**
MACHINE COMPANY
DETROIT 11, MICH. U.S.A.

WRITE FOR LITERATURE

Give full information—a description of the operation, normal and maximum torque at specified speeds, the number of times per minute the clutch engages and disengages, and other pertinent information.

NEED STEEL?

*Here's
the way
to get
it*

Scrap is needed to produce new steel. Millions of tons of steel products that have served their usefulness are idle—obsolete machines, structural shapes, pipe, old boilers and dozens of other awkward pieces.

Flame-cutting is a fast and economical way to reduce steel to pieces of the right size for charging into furnaces for the production of new steel. Line up a scrapping program *now*—we will be glad to help. Just call the nearest Linde office.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 E. 42nd St., New York 17, N. Y.  Offices in Other Principal Cities

In Canada: Dominion Oxygen Company, Limited, Toronto

FOR HEAVY LOADS—

such as this 15-TON CLEVELAND CRANE

OR

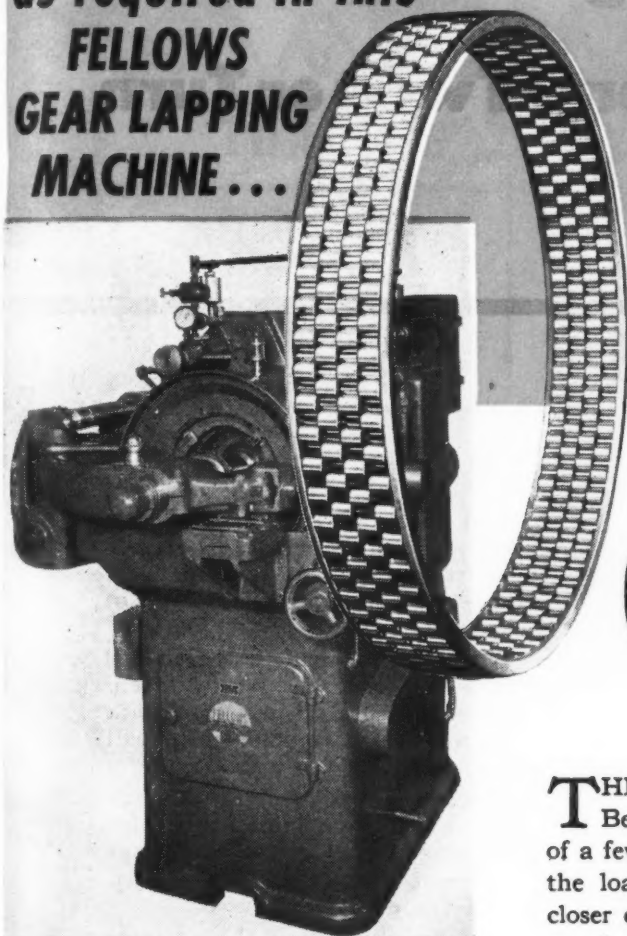
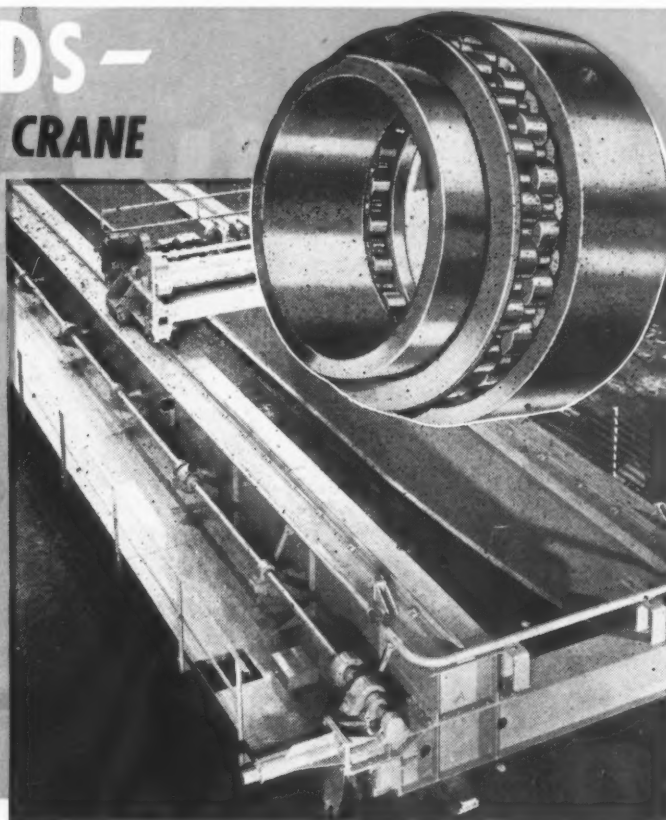
PRECISION RUNNING

as required in this

FELLOWS

GEAR LAPPING

MACHINE...



Specify

ORANGE "STAGGERED" ROLLER BEARINGS

THE unique staggered design of Orange Staggered Roller Bearings distributes the load over many short rollers, instead of a few long rollers. This multiplicity of contact surfaces within the loaded zone, provides greater load-carrying capacity. The closer center distances are responsible for the extremely smooth-running operation.

Use Orange Staggered Roller Bearings to save space—to carry heavier loads—to secure precision running—to increase the service life of your equipment.

Available in a full range of standard *interchangeable* sizes. Special sizes, such as the 17" dia. Fellows bearing illustrated, made to order. Send coupon for Engineering Data Book showing design, sizes, capacities, installation data, etc.



Shown above are end views of an Orange Staggered Roller Bearing and a conventional roller bearing. Note how staggered design brings maximum roller surfaces in contact with the load.

MAIL COUPON
FOR
ENGINEERING DATA

ORANGE ROLLER BEARING CO., INC.
552 Main Street, Orange, N. J.

Orange Roller Bearing Co., Inc.,
Orange, N. J.

Please send me your Staggered Roller Bearing Data Book

Name.....Title.....

Company.....

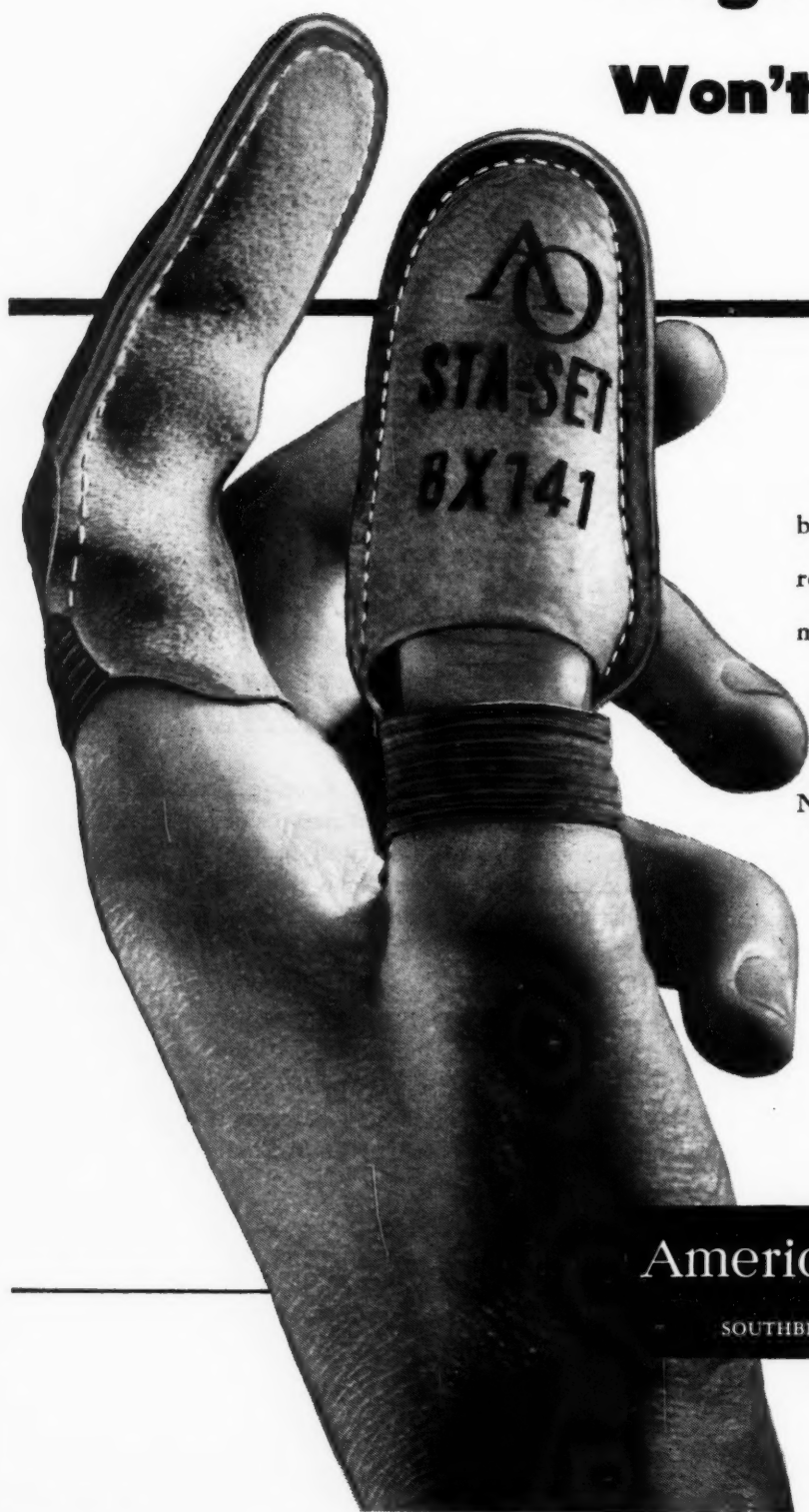
Address.....

City.....State.....

A-O "Sta-Set"

Finger Cots

Won't Twist or Turn



Full protection for both front and back of finger—and designed so that they just *won't* turn or twist even in roughest usage. Easily put on and taken off—allow complete freedom of movement.

No. 8X141 is made from selected grain leather; for use wherever sensitivity of touch is an important factor—such as soldering small wire, assembly work, etc.

No. 8X142 is made from high grade chrome tanned cowhide leather; for jobs involving especially hard usage—such as polishing, burring, grinding small parts, etc.

Both are available in three sizes—small, medium (or standard) and large. Your nearest A-O Safety Representative can supply you.

American  Optical *Safety Division*

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

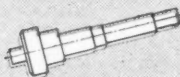
BRANCHES IN PRINCIPAL CITIES



Get
RESULTS
LIKE THESE...

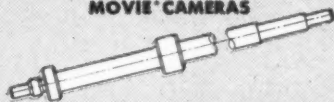
TURNING *Small Precision* PARTS

DIAL TELEPHONES



Drive Pinion Blank — 5 diameters held to .001" total tolerance; one diameter held to $\pm .0005$ ". Turned finish of 15 micro-inches on pivots. Material: Steel, B1113.

MOVIE CAMERAS



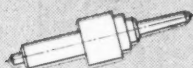
Cam Shaft—Total tolerance of $\pm .0005$ " on 4 diameters. Length of piece: 2.802"; 9 micro-inches of finish on pivots. .0003" concentricity run-out-total indicator reading. Material: Steel, B1113.

OIL SPRAY REGULATORS



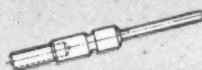
Nozzle Nib—Rough generated and form finished cone; tolerance of cone $120^\circ \pm 30'$ —0. 12 micro-inches of finish. Material: 430 F. stainless.

ELECTRIC METERS



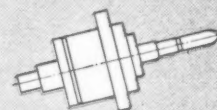
Second Train Staff Blank — .625" length overall. One generated taper: $67\frac{1}{2}^\circ$ generated cut-off. Tolerance on one diameter $\pm .0005$ ". Material: brass wire, free-cutting grade. Production: 480 pieces per hr. gross.

RADIO RECEIVERS



Connector—Centered, drilled .070" $\times \frac{1}{16}$ ", necked, turned and generated cut-off accomplished in one cycle of 6 seconds. Two diameters .060" and .104" held to $\pm .0003$ ". Concentricity between hole and outside diameter .0005" total indicator reading. Material: free-cutting brass.

INSTRUMENT PARTS



Hand Staff—7 turned diameters 4 of which were $\pm .0005$ ", 2 necking operations and formed radius. Total length .640". Concentricity .0004" total indicator reading on all diameters. Material: drill rod.

BY TOOLING THE JOB ON A **GORTON** (SWISS-TYPE) *Automatic*

Compare results on the jobs shown above with those of similar jobs in your own shop or with those you are sub-contracting.

See from these actual performance stories how users of Gorton Automatics are saving time and money and improving parts quality on production runs of this type. For complete details, write to Gorton Engineering Service. There is no cost or obligation involved.



FREE...Yours for the Asking

...a 16-page booklet containing complete details on the Gorton Automatic together with information on how to apply it to improve the speed and quality of your work. Write for your copy today.

GEORGE GORTON MACHINE CO.

1309 RACINE STREET, RACINE, WISCONSIN, U. S. A.

MACHINERY, September, 1946—299

Engineering for Mass

...an achievement of Jack & Heintz

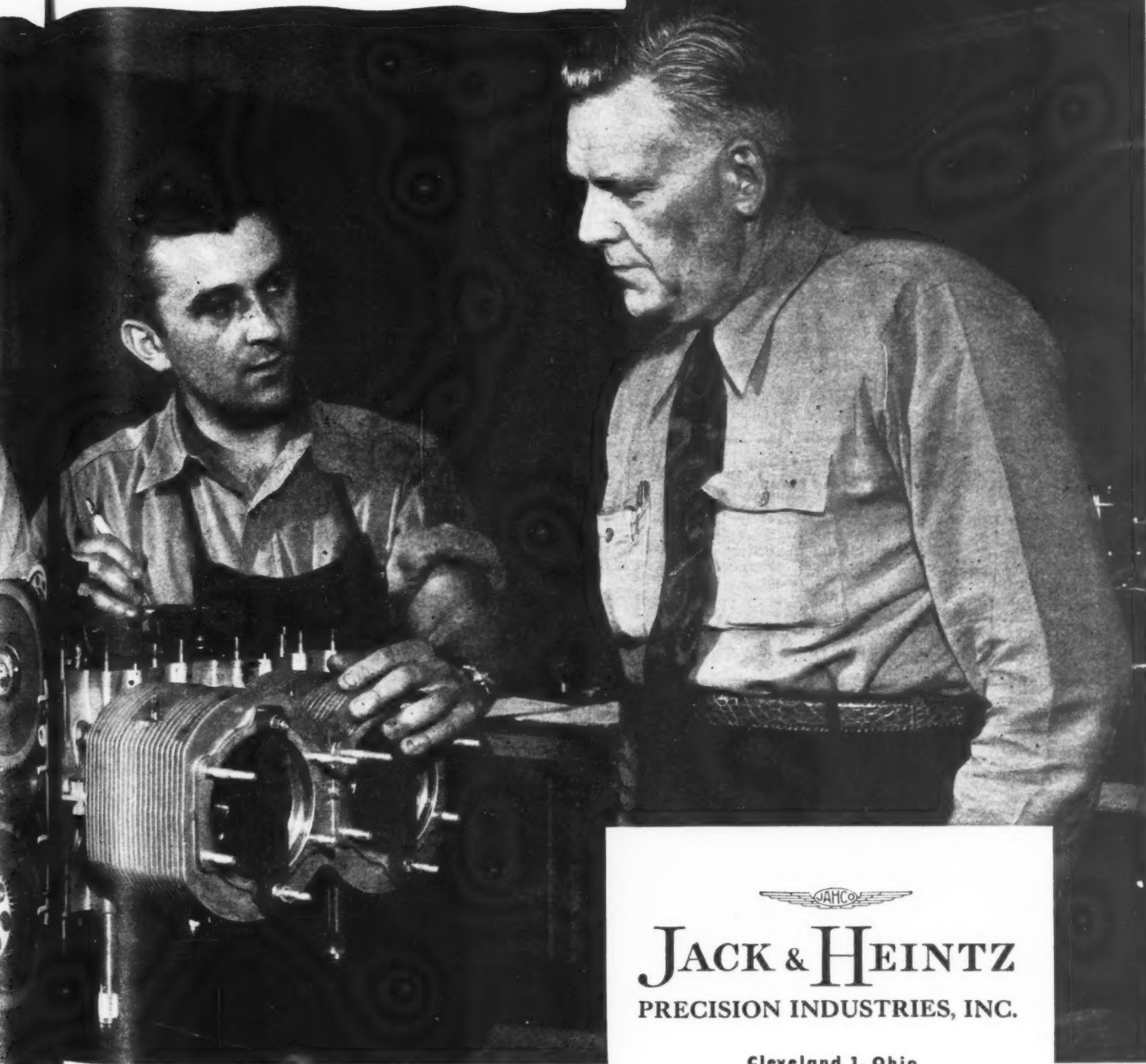
TEAMWORK

Working in an environment of rewarded initiative, Jack & Heintz engineers and craftsmen have developed a unique team spirit. Something new has been created in industry—8,000 workers, every one as enthusiastic, as determined to produce well and quickly as the managers themselves. Out of this enthusiasm and teamwork, has come a potent new engineering force. Jack & Heintz design engineers, development engineers and production engineers have created a new high standard of engineering coordination by which revolutionary designs and unheard-of precision have become mass-production realities. This combination . . . *engineering for mass precision* . . . created high-precision products by the millions to help win the war. This same teamwork . . . *engineering for mass precision* . . . is here today at Jack & Heintz as clearly, as forcefully as in the heat of war and it always will be. *And you can expect it in startling Jack & Heintz developments tomorrow.*



● MANUFACTURERS OF MOTORS, BEARINGS, AIRCRAFT ACCESSORIES,

s Precision



JACK & HEINTZ
PRECISION INDUSTRIES, INC.

Cleveland 1, Ohio

ES, **ELECTRONIC GAUGES AND MAGNETOS**

GOVERNMENT-OWNED SURPLUS

STEEL...



FREE INFORMATION

To War Assets Administration:*

Please send me full information, including availability and pricing of the following:

Carbon and Alloy Billets and Blooms ☐—H. R. & C. R. Alloy Sheets ☐—Strip and Plates ☐—Stainless Steel Sheet and Strip ☐—Mechanical Tubing, Carbon and Alloy ☐—Standard Type Valves and Fittings ☐

NAME.....TEL. NO.....

FIRM.....

ADDRESS.....

CITY.....STATE.....

*Send coupon to nearest Regional Office below for fast service.

STEEL can be bought now through War Assets Administration, for immediate shipment to you. Alloy steel billets, blooms and many items of alloy steel bars, particularly in the larger sizes, are available in Chicago, Cleveland, Detroit and other Regional Offices.

Lowscale prices make it worth your while to buy this high-grade material, even if you intend it for low-cost products.

Carbon and alloy steel mechanical tubing is also available in a wide range of sizes and specifications. Contact your nearest War Assets Administration Office below, or clip and mail the coupon.

All steel is subject to priority regulations. VETERANS OF WORLD WAR II are invited to be certified at the War Assets Administration Certifying Office serving their area and then to purchase the material offered herein.

EXPORTERS

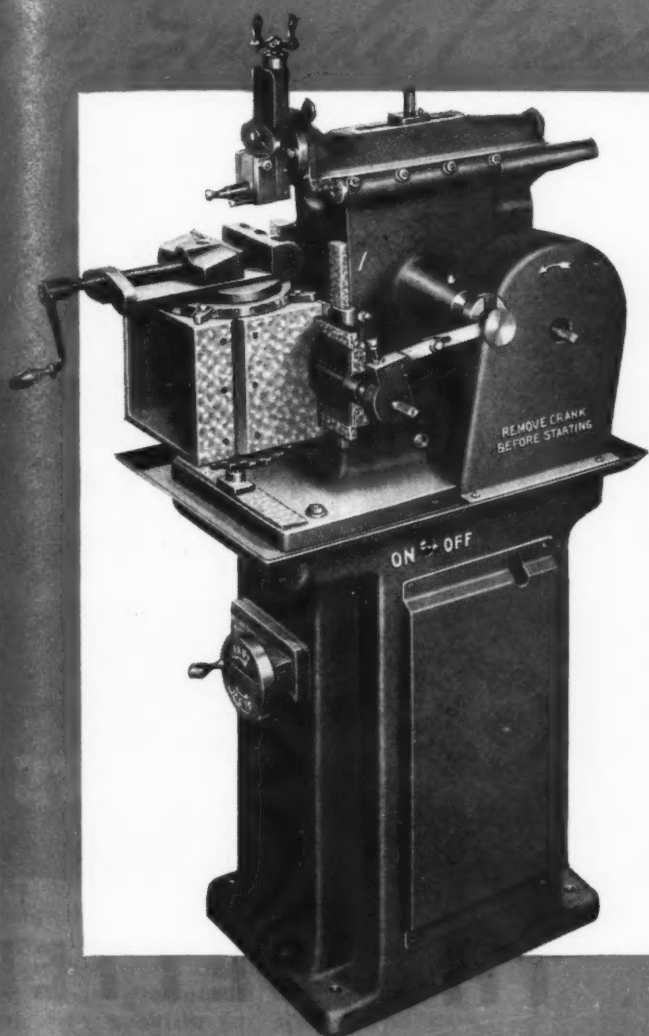
Most surplus property is available to the export market. Merchandise in short supply is withheld from export, and if such items appear in this advertisement they will be so identified by an asterisk.

WAR ASSETS ADMINISTRATION

GOVERNMENT
OWNED
SURPLUS

Offices located at: Atlanta • Birmingham
Boston • Charlotte • Chicago • Cincinnati
Cleveland • Dallas • Denver • Detroit • Fort
Worth • Helena • Houston • Jacksonville
Kansas City, Mo. • Little Rock • Los Angeles

Louisville • Minneapolis • Nashville • New
Orleans • New York • Oklahoma City
Omaha • Philadelphia • Portland, Ore.
Richmond • St. Louis • Salt Lake City • San
Antonio • San Francisco • Seattle • Spokane



Logan

A NAME TO REMEMBER WHEN
YOU THINK OF BETTER LATHES
AND SHAPERS

brief Logan

Shaper specifications:

Length of ram travel, $7\frac{3}{8}$ " ... strokes per minute, "Anyspeed," 64 to 175 ... length of bearings, main frame, 10" ... length of ram, $16\frac{1}{4}$ " ... width of ram, 5" ... table traverse, $10\frac{1}{2}$ " ... table vertical travel, $5\frac{1}{2}$ " ... table length, 8" ... table width, 8" ... table depth, $1\frac{1}{2}$ " ... saddle bearing, 6" ... toolhead travel, $2\frac{3}{4}$ " ... toolhead swivel, 360° ... toolhead diameter, 4" ... Cross feeds, 6 (.002, .004, .006, .008, .010, .012) ... Sprocket and chain drive ... vise $5" \times 5" \times 1\frac{1}{2}"$... motor, $\frac{1}{2}$ hp, 1750 rpm ... Height over all, 51" ... Shipping weight, shaper, stand and motor, 535 lbs.

NEW LOGAN 7-INCH SHAPER

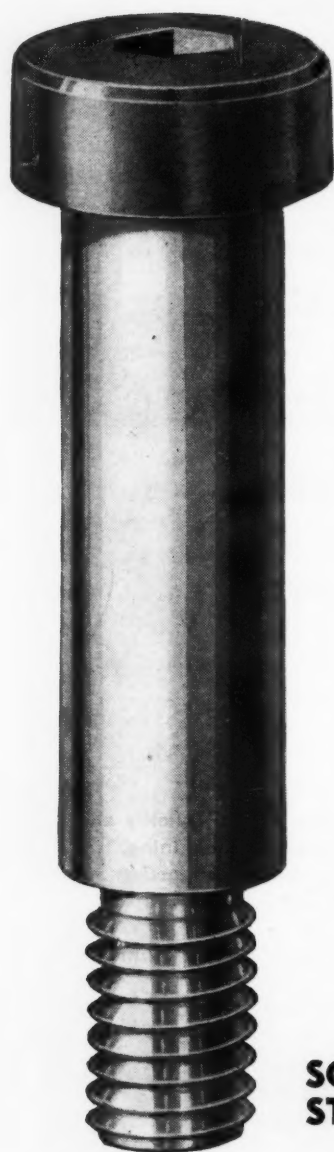
COMBINES EXTRA CAPACITY
HEAVIER CUTS AND
LASTING ACCURACY

The Logan Shaper is built by the same organization which engineers and builds the Logan Lathe. Quickly and easily set up, it handles a wide variety of work, including straight cuts, angular cuts, squaring, machining, and slotting operations. Built entirely of steel and cast iron, with extra weight at vital points, and rugged throughout, the Logan Shaper can take heavier cuts smoothly, with speed and accuracy, and without chatter. An extra heavy cast iron crank plate, for example, puts ample power behind every stroke. Positive, slip-proof operation, even on heavy cuts, is further assured by the roller chain drive. A maximum stroke of $7\frac{3}{8}$ " and any desired operating speed between 64 and 175 strokes per minute give the Logan Shaper capacity and versatility as well as accuracy. The speed can be changed instantly, without stopping the motor or shifting the belt. The ram is micro-set by a simple screw adjustment. There are six automatic feeds in either direction from .002 to .012, with a half turn of the feed handle reversing the feed. The tool head may be swiveled and instantly re-set to center by means of tapered locating pins, an exclusive Logan Shaper feature. For full information on the Logan Shaper, see your Logan dealer or write direct for catalog information.

LOGAN ENGINEERING CO. CHICAGO 30, ILLINOIS
MACHINERY, September, 1946—303

O-1

**DIE
DESIGNERS**
Specify



... THE BETTER FASTENING METHOD

STRIPPER BOLTS are used to attach the Stripper to the punch in Die Work and for attaching cams, links, levers and oscillating machine parts. H-K Socket Head Stripper Bolts may be set up tightly to close corners. More turns on the key may be made in restricted working areas. It's the Internal Wrenching!

Heads and bodies are perfectly concentric one with the other and with the threaded portion. Bodies are ground. The threads are perfect in lead and held to Class 3 fit. Scientific heat treatment develops the utmost in strength and fatigue resistance.

GUARANTEED UNFAILING PERFORMANCE

SOCKET HEAD STRIPPER BOLTS

Your Holo-Krome Industrial Distributor is ready to serve you from his warehouse stock.



THE HOLO-KROME SCREW CORP. HARTFORD, CONN., U. S. A.

For Speedy Precision Production

Canedy-Otto

8 SPEED MOTOR SPINDLE RADIAL DRILL

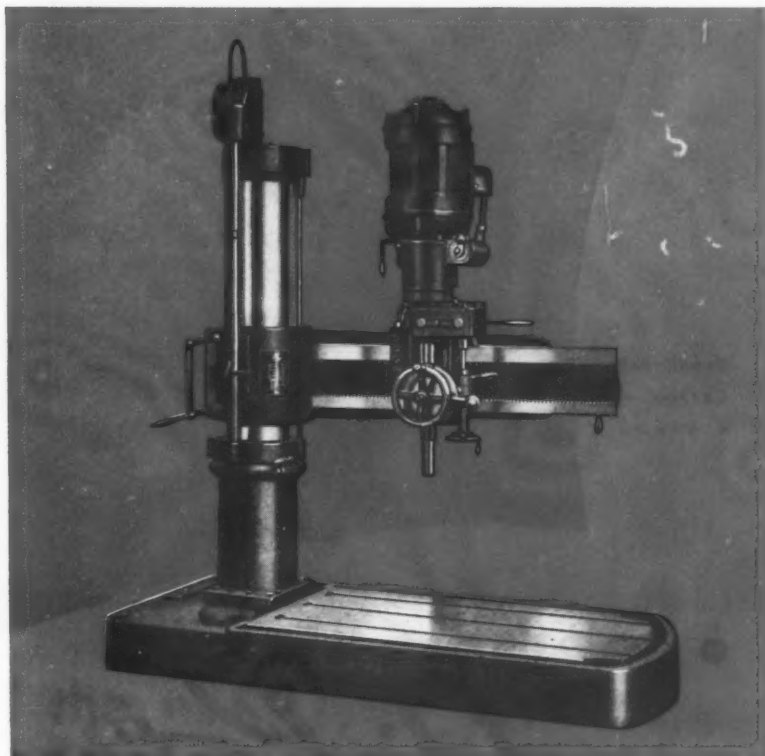
MANY EXCLUSIVE FEATURES

This new CANEDY-OTTO Radial Drill provides all the best features of many larger, more expensive radial drills, plus many exclusive features of its own.

It is powered by a 2-HP constant horse power, ball bearing mounted motor of 4-speed type, providing 8 spindle speeds; Three-button station provides instantaneous forward or reverse direction changes without going through the "stop" button for tapping; it has four rates of power feeds, changeable while machine is in operation; Large graduated dial and automatic trip provide for speed and accuracy in predetermined depth drilling.

Column and arm rotate on annular ball bearings and Timken bearings. Vertical movement of the arm on the column is controlled by a 2-way drum switch and motor. Saddle head rides on ball bearings, but clamps on hardened jib, to relieve bearings of load. The base is heavily ribbed, provided with T-slots and coolant tank. Unit is available in 3 ft., 4 ft., and 5 ft. arm models.

Write for detailed specifications.




CANEDY-OTTO engineers specialize in the design and production of drill presses. We build nothing else. But we do offer the world's most complete drill press line — a faster, more productive, more economical drill press for every drilling need. See us first for your drill press requirements. And when you have a special drilling problem, let a CANEDY-OTTO engineer — a drill press specialist — help you solve it.

BUILDERS OF A COMPLETE DRILL PRESS LINE



CANEDY - OTTO MFG. CO. — CHICAGO HEIGHTS, ILL.



Complicated
Coring —
4 Views

• **MADISON-KIPP**

Die Castings by the carload

Only the die casting process can produce in large quantities, so complicated a casting as the Float Valve body illustrated above. All other methods of production were discarded quickly when compared with the advantages of die casting from the standpoints of cost, accuracy, product appearance and daily manufacturing potential.

The Die Casting Industry is notable for its good mechanics who with great determination apply themselves to invent, produce and promote one success after another.

MADISON-KIPP

Corporation

203 WAUBESA ST., MADISON 4, WIS., U.S.A.

Skilled in die casting mechanics, experienced in lubrication engineering, originators of really high speed air tools.

ANCIENS ATELIERS GASQUY, 31 Rue du Marias, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

WM. COULTHARD & Co. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.



How to get rid of the noise you can't hear *

IN SPITE OF TESTING—ordinary gears that are quiet at the time of installation may develop noise and become costly maintenance problems. This is the reason scores of manufacturers have found it wise to invest in Double Diamond extra quality.

Special hardening processes, skillful machining and

more rigid inspections assure this extra precision. It will pay you to take advantage of Double Diamond Engineering Service. Whether you have a gear design or application problem, experienced Double Diamond designing consultants will assist you in obtaining longer trouble-free service from gears.

AUTOMOTIVE GEAR WORKS, INC., RICHMOND, INDIANA



the gears with the *
"JEWEL MOVEMENT"

**FOR AUTOMOTIVE,
FARM EQUIPMENT AND
GENERAL INDUSTRIAL
APPLICATIONS**



HYPOID GEAR



SPIRAL GEAR



BEVEL GEAR



TIMING GEAR



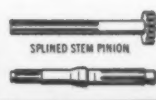
WORM GEAR



SPUR GEAR



PINION



SPLINED STEM PINION



YOU GET MORE THAN JUST TOP-NOTCH ACCURACY WITH

Ettco-Emrick
TAPPING
ATTACHMENTS

Not only do you get clean and accurate threads with Ettco-Emrick Tapping Attachments, but you also get these three big "plus" features:

1. SENSITIVITY — The patented Ettco - Emrick friction clutch has the sensitivity of a hair-trigger.

This gives your work full protection from spoilage and also prevents tap breakage.

2. EASY OPERATION—All the necessary tapping skill is built into Ettco-Emrick Attachments by special design features. That's why ordinary unskilled operators—men or women—can turn out fast accurate tapping with them.

3. ECONOMY—Ettco-Emrick Tapping Attachments not only save labor and materials, but they give you these savings at a very low first cost—because they work right on your presses like any other shank tool.

It's these "plus" factors that have made Ettco-Emrick Tapping Attachments favorites for so many years in shops throughout the country. They're a profitable investment for any shop. For full details,

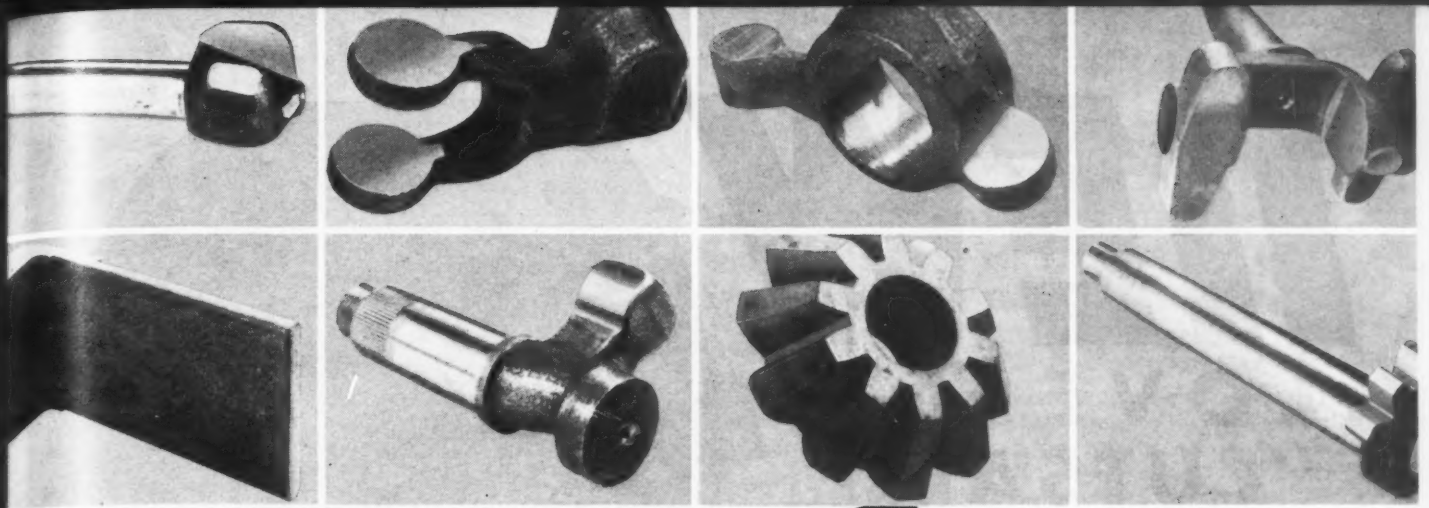
WRITE FOR BULLETIN NO. 2

ETTCO TOOL CO.

592 JOHNSON AVENUE, BROOKLYN 6, N. Y.
DETROIT 1 • CHICAGO 6

MADE IN 7 SIZES
FOR No. 0 TO 1" TAPS

Over 25 years specialization in solving industry's drilling and tapping problems



Surface Broaching

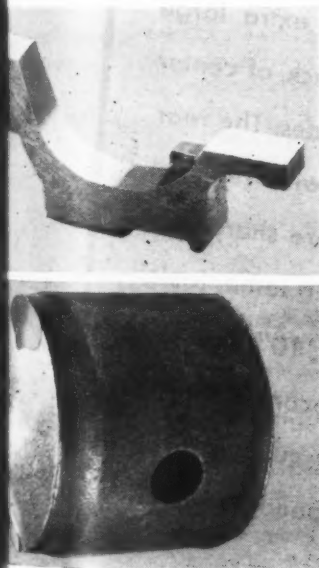
in the automotive industry

Wherever metal is removed on large quantities of duplicate small parts you are apt to find a place where Footburt Surface Broaching Machines can cut Manufacturing costs. Production is high, parts can be machined to very close tolerances and tool maintenance

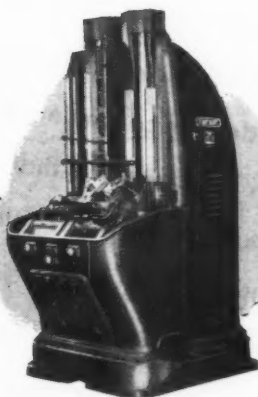
is low in cost per piece. We have had many years of experience in designing the tooling for various types of parts and will gladly advise you in applying surface broaching to your work.

THE FOOTE-BURT COMPANY
CLEVELAND 8, OHIO

Detroit Office: General Motors Building



• Duplex Surface
Broaching Machine
... also Single Slide
Machine



Footburt Patented Tooth Form

FOOTBURT *Surface Broaching*

NEW

LOVEJOY "CUTSALL"

CARBOLOY TIPPED
CEMENTED CARBIDE
TOOL-BIT-TYPE

FACE MILL

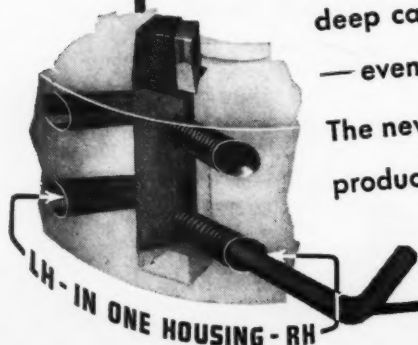
- POSITIVE and NEGATIVE RAKE, RIGHT and LEFT HAND in ONE HOUSING
- FINE BLADE ADJUSTMENT
- EXTRA LARGE CARBOLOY TIPS



Lovejoy proudly presents another new face milling cutter that is designed especially for the most modern milling practices. The tool-bit-type blades can be supplied for right- or left-hand cutting, with the same housing. The extra large Carboloy tips mean extra long wear—the face of the blades is back of center so that positive or negative rake is easily obtained from the same blades. The rear on the blade is tapered so that fine adjustment may be made with rear set screw—front set screw securely locks blade in the housing. Blades are sharpened on an off-hand, adjustable table grinder exactly the same as regular lathe tools.

This new Carboloy tipped "Cutsall" cutter is available in 6", 8", 10" and 12" diameter sizes. All sizes use the same blades for convenience and economy. Note the husky, balanced construction—it is your guarantee that facing cuts up to $\frac{3}{4}$ " deep can be taken on tough stock even when spindle speeds are high—even when cuts are intermittent.

The new Lovejoy "Cutsall" has the goods to deliver the goods. Write for production information, prices and delivery—all three will please you.



LOVEJOY
TOOL COMPANY, INC.
Springfield, Vermont, U. S. A.

"More Profitable than Politics or Stamping Silver Dollars"

- K. R. Wilson

THIS 100-TON KRW HYDRAULIC PRESS BRAKE PRODUCES JAMB SECTIONS FOR 2,000 WINDOWS A DAY AT A FRACTION OF THE COST OF HEAVIER EQUIPMENT ... HOLDS WORKER FATIGUE TO A MINIMUM

This press had been in operation only a few days before the Wendling Iron Works of Buffalo ordered three more ... that's how satisfactory it proved in use. Now it is turning out 4,000 jamb sections, for 2,000 windows (illustrated below), in two 8-hour shifts a day. No longer is it necessary to buy tons of unnecessary weight in a press in order to get efficient production. KRW welded construction plus scientific distribution of stress and load has radically changed all that. This 100-ton KRW press weighs a fraction, and costs a fraction of comparable equipment. Because this press is hydraulically operated and not mechanically driven, it is quiet and almost vibrationless in operation. The press cannot be jammed by careless operation ... the platen can be stopped and reversed at any point in its travel. Two heavy-duty cylinders develop controlled pressure to perform the work. Pressure is perfectly equalized between these cylinders by the exclusive KRW mechanical linkage and torque bar arrangement. Pump equipment varies depending upon customer requirements. This press can be engineered as a gap type or with open or closed ends. Write for details, or better still, tell us what you want to accomplish and we'll quote you specifically. Mail the coupon.



QUIET

IT WOULDN'T WAKE A BABY. Easy, even hydraulic pressure does the work. No jarring impact as the die bottoms. No shock to the worker to lessen efficiency.



VIBRATIONLESS

GLASS OF WATER ON THE PLATEN, YOU'LL NEVER SPILL A DROP. That's how evenly pressures are distributed over the unit. That too, is another reason why dies last longer in a KRW.



DEFLECTION NIL

NO SWAYBACK PLATENS TO WORRY ABOUT. Where pressures require it, bed rails, platens and head are trussed and ribbed to eliminate deflection. Press illustrated stamps three jamb sections per stroke.

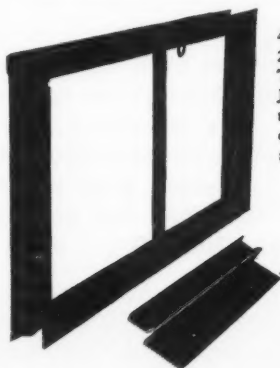


Specifications

KRW 100-TON PRESS BRAKE

Upper Platen 2½" x 14" x 44"
Lower Platen 2" x 12" x 44"
40 Strokes per minute
Floor Space Req. Incl. Power Plant 42" x 80"
Overall Height 94"
Weight Incl. Power Plant... 5,500 lbs.
Ram Pressure 100 tons
Automatically Controlled Stop

Can be made as gap type, or with open or closed ends. Distance between uprights and length of platens can be increased or decreased, depending on your needs.



4,000 jamb sections, 2,000 windows a day. That's production. Jamb is formed in two operations, first operation shown at left.

DIES QUICK DELIVERY TO YOUR SPECIFICATIONS

We have arranged dependable connections for the manufacture of all types of dies for KRW Press Brakes. Send us your blueprints and specifications for accurate costs and delivery date.

**NAME YOUR NEEDS
WE'LL QUOTE PRICE
AND QUICK-DELIVERY
DATE..FILL OUT AND
MAIL COUPON**

K. R. WILSON, 215 Main St., Buffalo 3, N. Y.

15

Please give me the facts regarding the KRW 100-ton Press Brake.

Name

Address

City Zone State

Capacity and size needed

K. R. WILSON

BUFFALO 3, NEW YORK

*New
automatic*

MAXITORQ



OVERLOAD RELEASE CLUTCH

Machine Builders . . . Production Engineers . . . Operators of Packaging Machines . . . here is the Safety Clutch you have long wanted.

By means of a simple yet delicately made finger-tip adjustment this clutch can be made extremely sensitive to any overload condition. Disengagement is automatic and instant when overload takes place, and the clutch slips positively into neutral.

The OVERLOAD RELEASE feature is an added refinement of the standard MAXITORQ FLOATING DISC CLUTCH . . . a feature of great value in high speed production, especially when breakable or damageable objects are being processed.

"Floating Disc" means that discs are actually floated apart in neutral . . . held free of each other by Maxitorq (patented) Separator Springs. No drag, no abrasion, no heating.

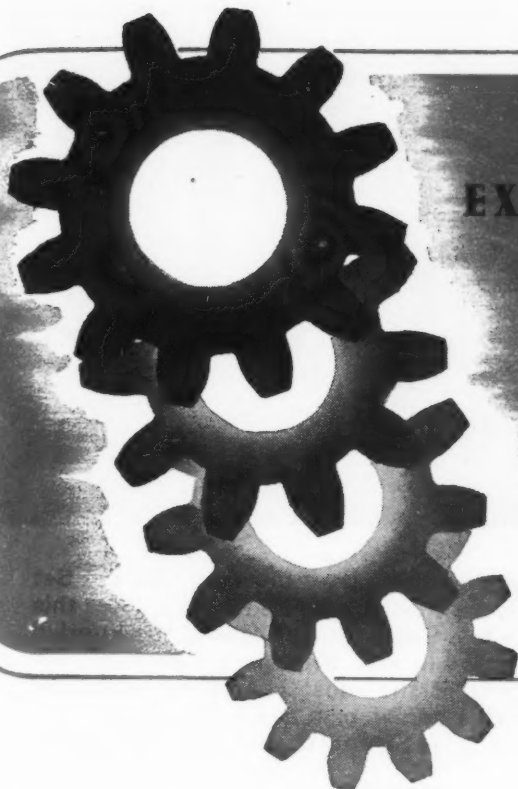
Also, you may assemble, adjust or take the clutch apart without the use of tools.

Clutches are available in 6 standard sizes, $\frac{1}{4}$, $\frac{1}{2}$, 1, $1\frac{3}{4}$, 3 and 5 H.P. at 100 R.P.M., for use on a continuous shaft or as a cut-off coupling type for connecting two shafts.

You will want the specifications and full details of the Maxitorq Overload Release Clutch . . . which adds new dependability to power distribution and control. Send today for Bulletin No. M9.



THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER CONNECTICUT



EXCELLENT CHARACTERISTICS
OF SHAVED GEARS

*Can be Preserved
in Hardening*

Gear tooth hardness need no longer be a compromise between machinability and wear resistance. Red Ring Rotary Gear Shaving as the final machining operation on the green gear, during which approximately .001" of stock is removed from the tooth surfaces, corrects cutting errors of index, helical angle, tooth profile, eccentricity and undesirable tooth roughness.

This corrected gear may then be induction hardened to whatever surface hardness is desired and without objectionable distortion. Hardening without detrimental distortion is frequently accomplished on gears carburized after shaving by quenching in dies and sometimes by liquid carburizing and quenching without dies. No grinding of tooth profile is necessary.

On a 5.145" P.D. gear so treated, final involute error is held to between $+.00015''$ and $-.00015''$; parallelism to .0002"; tooth spacing to .0001" to .0002"; and accumulated error to .0008".

WRITE FOR DESCRIPTIVE FOLDER
ON RED RING GEAR SHAVING



Specialists on SPUR AND HELICAL
INVOLUTE GEAR PRACTICE
Originators of ROTARY SHAVING
AND ELLIPTOID TOOTH FORMS

**NATIONAL BROACH
AND MACHINE CO.**

RED RING PRODUCTS

5800 ST. JEAN • DETROIT 13, MICH.

Wherever you need
a Cup-Point
Set Screw
that.....



See the Point

Fig. 164
Pat. Applied for

PUT

... you'll choose the "Unbrako" Socket Set Screw with the Knurled Point, for this screw is a Self-Locker, because the knurled point digs-in and refuses to budge... regardless of the most chattering vibration! Yet, this screw can easily be backed-out with a wrench and used again and again.



Reg. U. S. Pat. Off.

The "Unbrako" Knurled Socket Head Cap Screw

has a knurled head which provides a non-slip and fumble-proof grip even for oily fingers so it can be screwed-in faster and farther before it becomes necessary to use a wrench. The knurled "Unbrako" Cap Screw is so neat and good-looking that it helps to "doll-up" the looks of any piece of machinery.



Both screws in sizes from No. 4 to 1/2"; full range of lengths. Write for the "Unbrako" Catalog.

"Unbrako" and "Hallowell" products are sold entirely through distributors.



SOCKET SCREW
KEY KIT

Knurling of Socket
Screws originated with
"Unbrako" in 1934.

The "Hallowell" Socket Screw Kit is a modern MUST—ask us. 9 interchangeable bits within your grasp in the hollow handle.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PA. BOX 22
— BRANCHES —

Boston, Chicago, Detroit, Indianapolis, St. Louis, San Francisco

Over 43 years in business.

"Order 6 more of those
XY Machines...
I SEE the first one
just completed its
Guarantee Period"



There's no doubt about a product's guarantee . . . when a Veeder-Root Counting Device is built into that product to keep a running record of its performance from the moment the switch is first thrown. For then your customer gets a "counter-signed" statement of performance delivered as promised, with the figures *plain to see*, in bold black and white. No room for argument. No reason to lose money, tempers, or goodwill. Instead, there's every reason to help you win additional business.

Veeder-Root Devices are made in scores of types, to count every unit of motion or performance, mechanically or electrically. They are compact, and easy to work into any design limitations. Drive connections are simple, so they present no assembly problems. And they are inexpensive, so there's no strain on your

price structure. Find out just how you stand to gain by giving your customers the benefit of Veeder-Root Countrol . . . a new and interesting feature which you can merchandise in many ways, *as with a tag like the one below on each machine you sell*. Write.

VEEDER-ROOT INCORPORATED

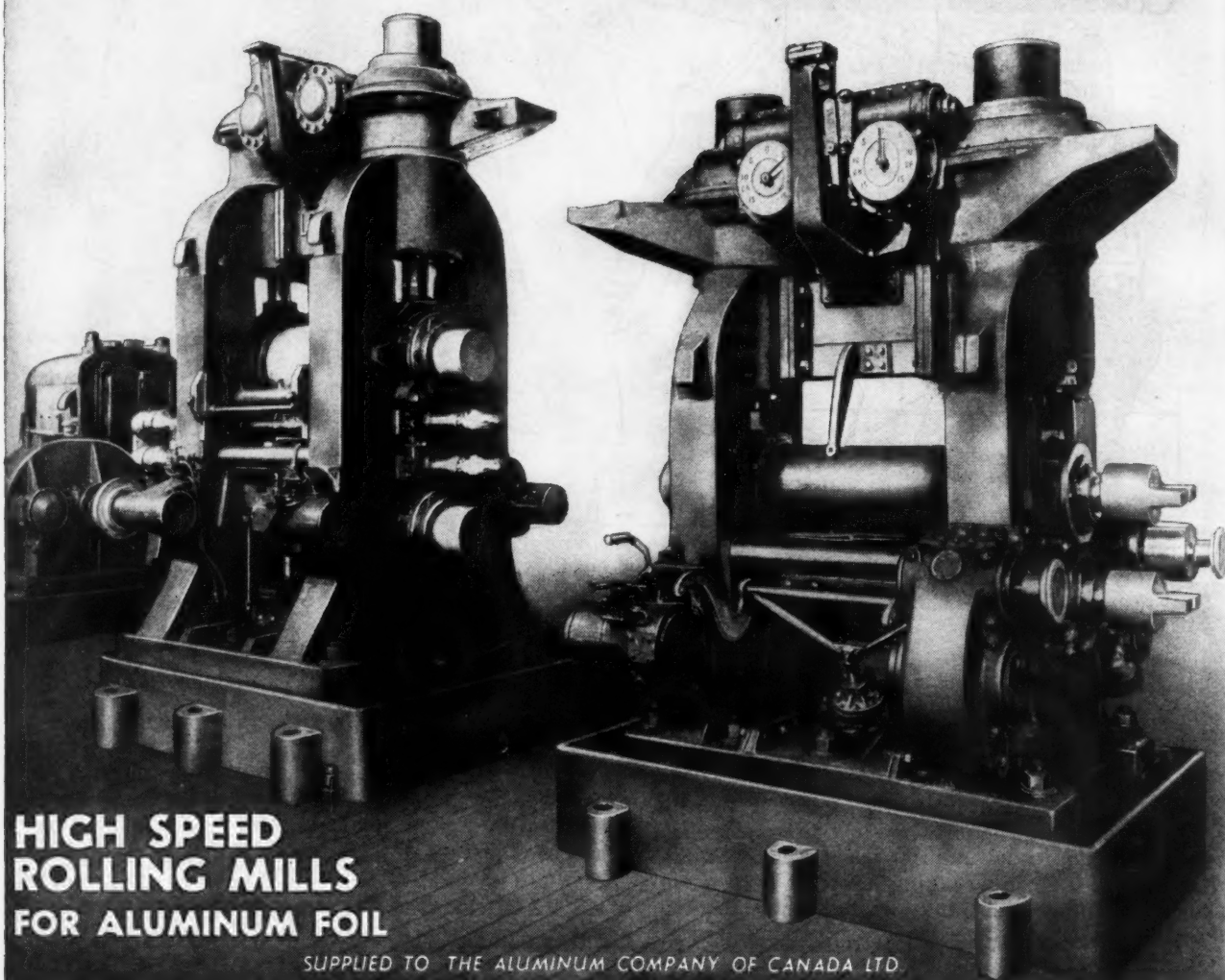
Hartford 2, Connecticut

In Canada: Veeder-Root of Canada, Ltd., Montreal

In England: Veeder-Root Ltd. (New address on request)



ROLLING MILLS AND ROLLING MILL EQUIPMENT FOR FERROUS AND NON-FERROUS METALS



HYDRO BOOTH 352 IRON AND STEEL EXPOSITION CLEVELAND PUBLIC AUDITORIUM OCTOBER 1, 2, 3 and 4 CLEVELAND OHIO PRESS • INC.

ENGINEERS

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HYDRAULIC PRESSES • ROLLING MILLS • PUMPS
ACCUMULATORS • DIE CASTING MACHINES

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Productioneering In Metal



Productioneering, as practiced by Sommer and Adams, is the simultaneous planning of product and production method, in collaboration with the producer, aiming at lowest cost with assured consistency of high quality.

Modern producers of metal goods are constantly coming face to face with processing-for-profit problems of which the right solution lies in functions for which no proper machinery exists . . . in methods and machines as yet "undreamed, but dreamable". Such distinctly special purpose machinery is produceable only by organizations with a particular "know how" in the realm of out-of-the-ordinary production engineering.

The modern plant above houses just such an organization, The Sommer and Adams Company, with a quarter of a century of experience backing up our oft repeated claim that . . . "If it can be made automatically . . . Sommer and Adams can build you a machine to make it . . ."

Let your imagination romp in applying these questions to YOUR production . . .

1 . . . Is there any possibility of new or combined automatic operations to eliminate cost factors (no matter how unusual)?

2 . . . Is the market potential adequate to pay off on the increased production such improved methods will develop?

If answers are affirmative, Sommer and Adams Productioneering can help you.



THE

SOMMER AND ADAMS

COMPANY

18515 EUCLID AVENUE • CLEVELAND, OHIO

Custom-Built EQUIPMENT FOR MANY PURPOSES

SUBSIDIARY OF THE FEDERAL MACHINE AND WELDER COMPANY

MACHINERY, September, 1946—317



R and L TURNING TOOL

Built in five sizes, it does the work of 14 tools, saves over \$200 in first cost alone! Can be set up to perform as many as three different operations at once. Can be changed in ten seconds from right- to left-hand operation. Roller backrest may be quickly substituted for the burnishing backrest shown.

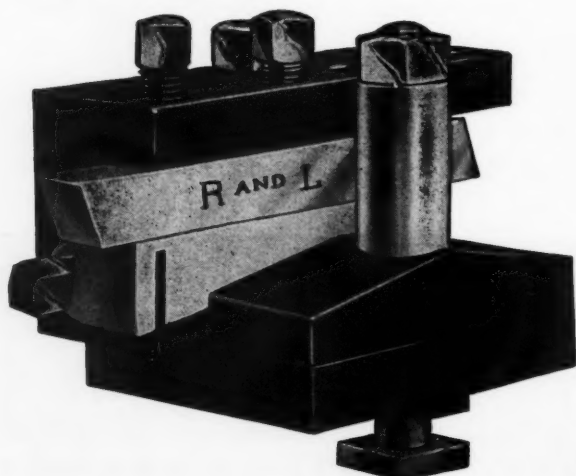


R and L TAP AND DIE HOLDER

Use it for both right- and left-hand threading. New design eliminates spring plungers and small screws, makes action fast and positive. Engaging teeth separate fully—and instantly—when released, eliminating wear.

R and L UNIVERSAL TOOL POST

Use this versatile tool post on either the front or back cross-slides of your automatics, with the spindle running in either direction. Simply, ruggedly built, it holds both square and flat tools securely.



CHOOSE **R** RIGHT AND **L** LEFT TOOLS
TO LOWER TOOL COSTS
AND BOOST PRODUCTION

Make one tool do the work of two—or three—by specifying R and L Tools for your turret lathes and screw machines. Their multiple use, multiple operation features reduce tool costs and set-up time; they speed production by doubling up on operations, increasing efficiency, reducing time out for replacement and repairs. The R and L Turning Tool, for example, can be set up to perform as many as three simultaneous operations at one work station. Use it for drilling, turning and burnishing; for turning and centering; for form turning; for turning two diameters and for many other combinations of operations. The other tools in the R and L line have similar advantages that speed up and simplify production. Write for your copy of the R and L Idea Booklet and find out how these versatile tools can lower your tool costs and actually boost your production at the same time!

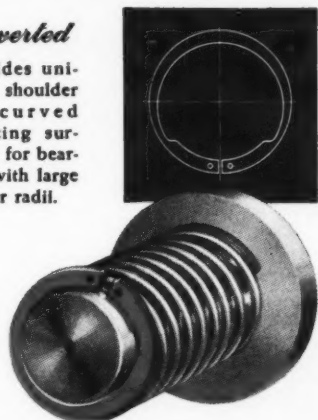
R AND L TOOLS

1825 Bristol St., Nicetown, Philadelphia 40, Pa.

Precision fastening for any need: Waldes Truarc Special-Type Retaining Rings

Inverted

Provides uniform shoulder for curved abutting surfaces, for bearings with large corner radii.



Beveled & Bowled

Takes up end-play rigidly or resiliently, accommodates accumulated tolerances.



Self-Locking

Economical where thrust is moderate — holds fast, yet shaft requires no machining.



Interlocking

2-piece ring takes heavy thrusts, gives positive lock, secure against high RPMs.



*Crescent**

Snap on radially where axial assembly is impossible. No special tools needed.



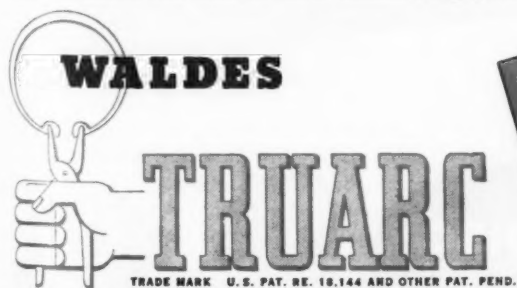
E-Ring

Variant of Crescent for small shafts; provides large, strong shoulder. Easily removed.



● There's a Waldes Truarc precision-engineered ring to answer every need. Truarc Retaining Rings give a never-failing grip because of their mathematically precise construction. No matter how demanding your specifica-

tions, it's a simple matter to refine your present designs to save material, machining and assembly costs. Waldes Truarc engineers will help you, will give your particular problem individual attention without obligation.



RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

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VISIT TRUARC BOOTH • INSTRUMENTATION-FOR-TOMORROW EXHIBIT
HOTEL WILLIAM PENN, PITTSBURGH • SEPTEMBER 16-20

Waldes Kohinoor, Inc., 47-10 Austel Place
Long Island City 1, N. Y., Dept. 23-F

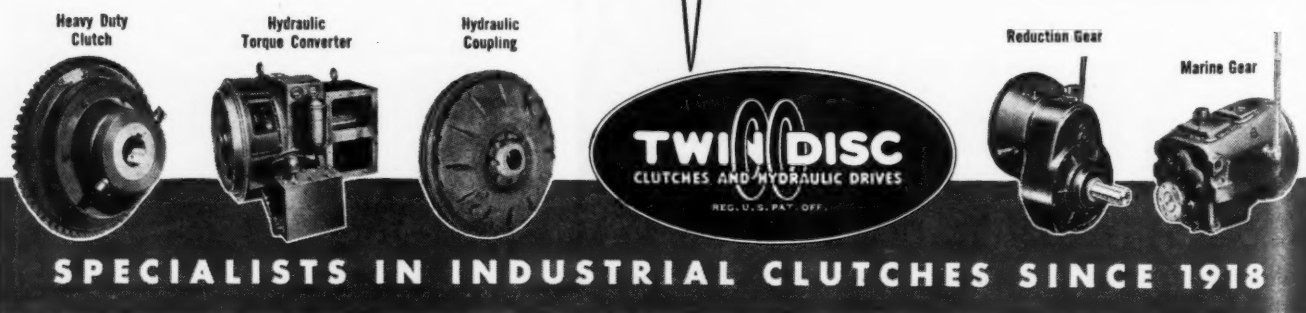
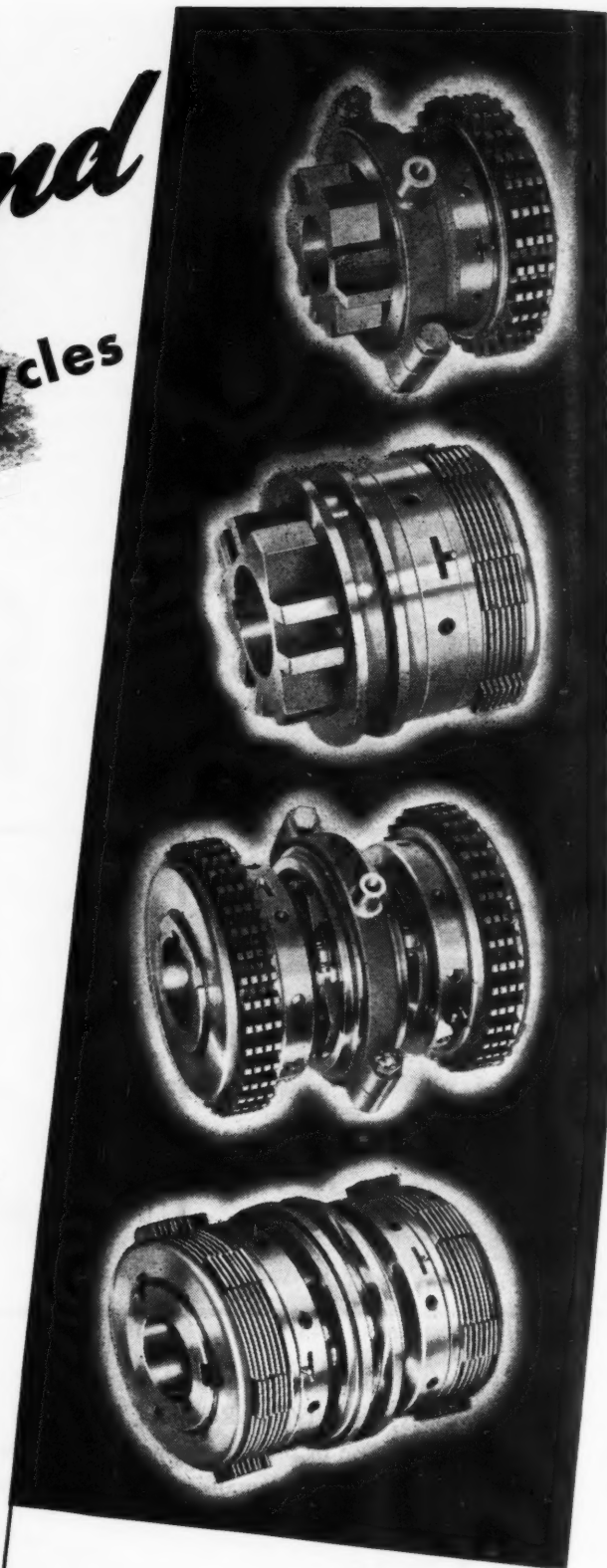
Please send Catalog No. 4 on Truarc Retaining Rings to:

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Title _____
Company _____
Address _____
City _____ Zone _____ State _____

Split-second operation for faster work cycles

The Twin Disc Machine Tool Clutch has a high torque capacity with comparatively low operating pressures. This is one reason why it is the first choice of engineers where work cycles are figured in fractional seconds. Not only does this characteristic prevent excessive wear and materially increase work-life, it definitely plays a part in the smoother operation and quick release necessary to split-second operation . . . to faster work cycles. TWIN DISC CLUTCH COMPANY, Racine Wisconsin (Hydraulic Division, Rockford, Illinois).

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To run dry
2. Model MTS (Single)
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3. Model MTU (Duplex)
To run dry
4. Model MTU (Duplex)
To run in oil





**IT'S NOT ONLY *Which* CUTTING MATERIAL
BUT HOW YOU USE IT THAT COUNTS**

**Have you a copy of the
Allegheny Ludlum
"Fabrication Blue Sheet"?**

Contains a wealth of reliable, certified data, not only on the machining of Allegheny Metal, but on the best methods employed in other fabrication operations on stainless steel—forming, welding, finishing, etc. Write for your copy—you'll find it highly useful and complete.

ADDRESS DEPT. M-45

THERE'S hardly a single cutting operation that can't, in some way, be improved. Our record files contain hundreds of instances. Re-design of the tool itself often works wonders. In other cases, a switch of cutting materials shows a marked increase in production, or in pieces between grinds.

That's the job of our Mill Service organization—to work with you for improvement—and the Allegheny Ludlum line now offers you absolutely complete selection. The range extends from Carmet carbide metal blanks and tipped tools—through ALX cast alloy-metal ground bits—to DBL and Super DBL low-tungsten high speed steels, as well as the various high-tungsten and "moly"

types of high speed steels. Call us in, any time, anywhere.



**ALLEGHENY
LUDLUM
STEEL CORPORATION**

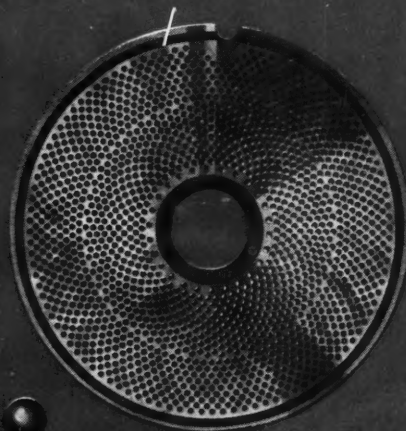
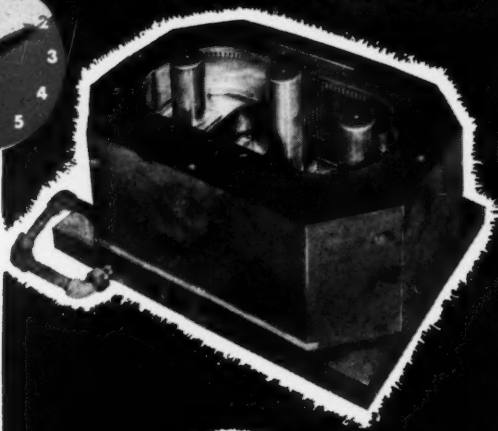
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W&D 622

STEELS THAT CUT DOWN MACHINE-HOURS

IN DIE MAKING

IN GENERAL MACHINING



On the Tough Jobs...Try *SPEED CASE* or *SPEED TREAT*

Whenever you have a job requiring steel plate, where machine-time per part will be long and costly, use Holliday "time saver" low carbon *Speed Case* or medium carbon *Speed Treat*. Typical applications are found in all types of die making . . . and in general machine work on such parts as (above) food chopper plates and hydraulic valve blocks. Free machinability, exceptionally smooth finish, and minimum warpage in heat treating or carburizing are a few of the outstanding advantages offered by these unusual steels. Let us give you the facts . . . send your inquiry to the nearest warehouse listed below.

SPEED CASE
LOW CARBON
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SPEED TREAT
MEDIUM CARBON
OPEN HEARTH
FREE MACHINING
**STEEL
PLATES**



W. J. HOLLIDAY & CO.

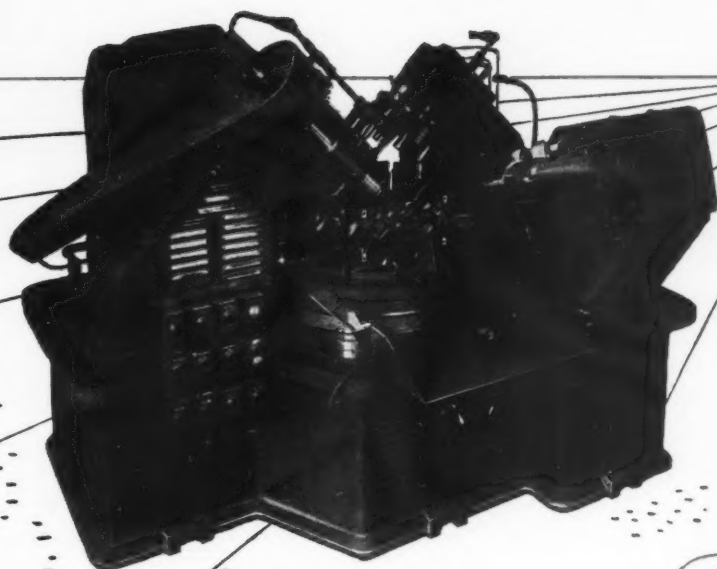
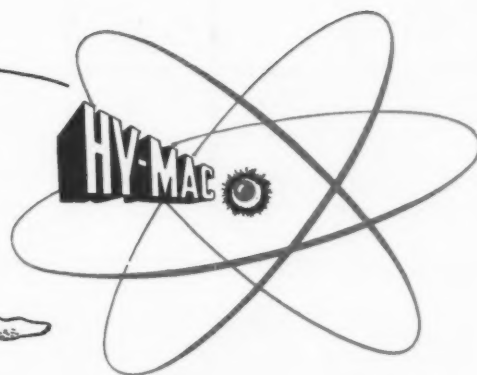
Speed Case — Speed Treat Plate Division

HAMMOND, INDIANA

Plants: Hammond and Indianapolis, Indiana

Distributed Coast-to-Coast in All Common Plate Sizes from these Warehouses:

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Beals, McCarthy and Rogers, Inc.	Pidgeon-Thomas Iron Company
BOSTON 10, Massachusetts	NEWARK 5, New Jersey
Brown-Wales Company	Grammer, Dempsey & Hudson, Inc.
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Emblematic OF NEW HORIZONS

Another "HYMAC" special purpose machine simplifies a series of operations on an automobile part . . . a four stage machine for drilling, spotfacing, counterboring and tapping of the vacuum holes in intake manifold . . . Cycle of Operation is entirely automatic except for loading and unloading (1) Part manually loaded and clamped into position (2) Upon closing safety door—electric contact is made and the machine automatically indexes to position—all of the heads moving forward and completing their operation (during the cycling time of the heads, another part is loaded). (3) Part is unloaded. Production Rate: 120 manifolds per hour. Machine is hydraulically operated and electrically controlled . . . Send us a print of a part that is to be processed, together with the production requirement and our engineering department will make recommendations and preliminary proposal without obligation.

Also send for eight page brochure which completely outlines our facilities.

HYDRAULIC MACHINERY, INC.

12825 FORD ROAD

HYDRAULIC MACHINERY—Western Division

Dearborn, Michigan

Glendale, California



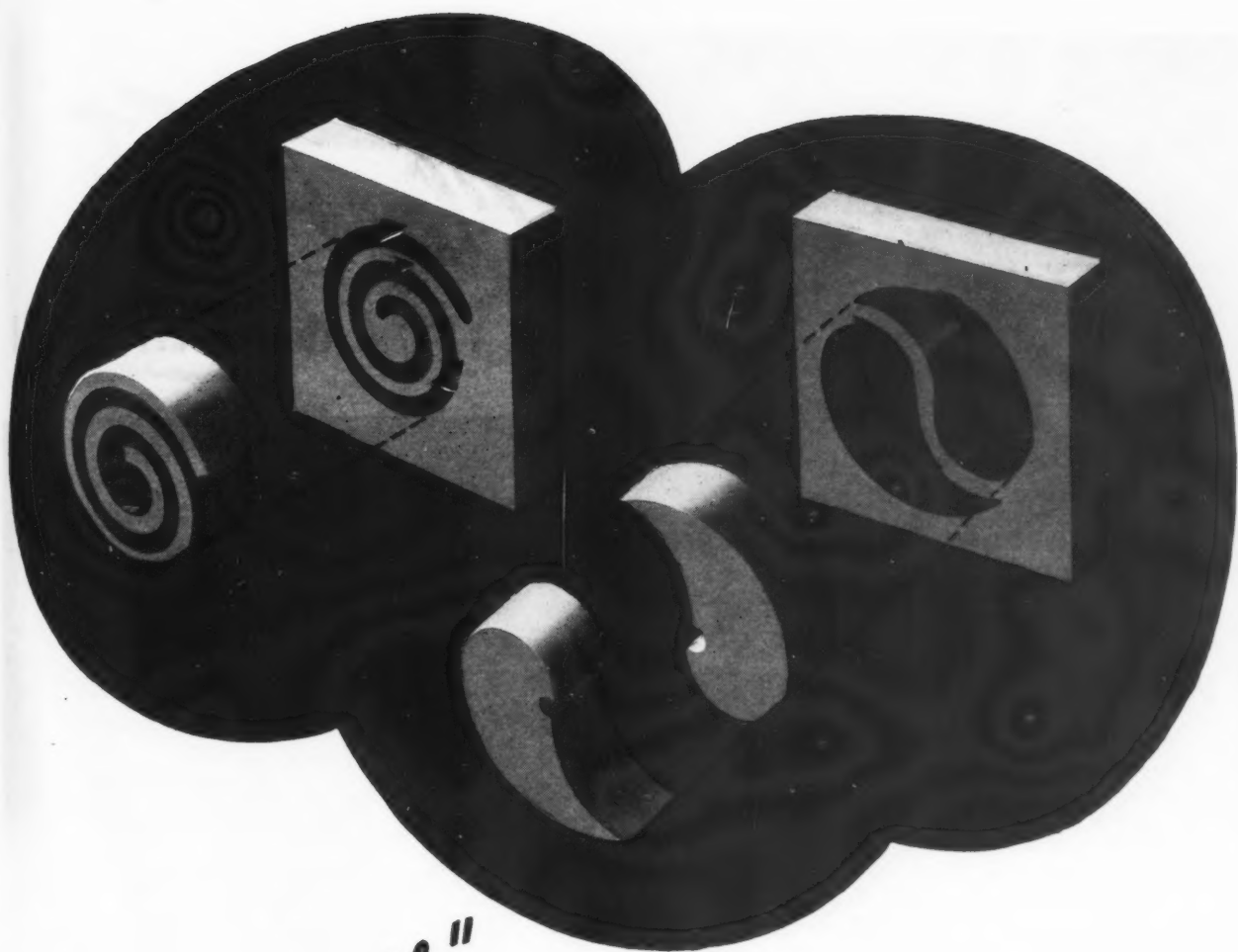
Count the Cost **per TAPPED HOLE**

The cost of a tap is determined by its capacity to produce smooth, accurate threads with a minimum number of rejects . . . not by its initial cost. You are assured greater dependability, longer runs between grinds, speeded-up thread production by the use of Hanson-Whitney taps. Let Hanson-Whitney engineers help you lower the cost per tapped hole by applying the proper tap for a specific job. For further information, write:

Hanson Whitney Machine Company, Hartford, Conn.

Hand it to **Hanson Whitney**

M A C H I N E C O M P A N Y
H A R T F O R D • C O N N E C T I C U T



THE "Impossible"

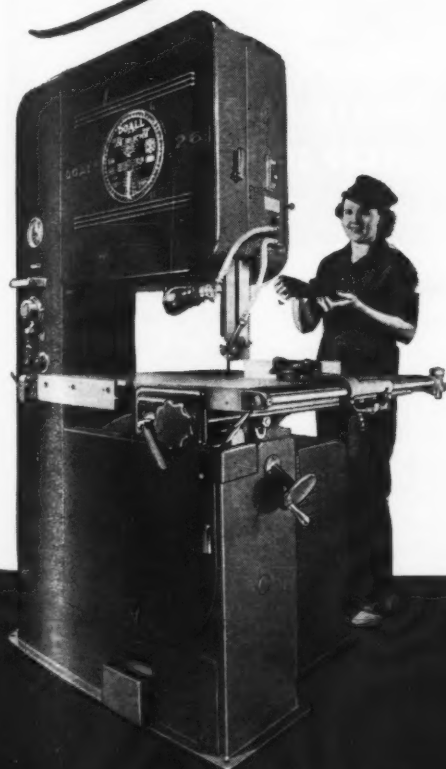
WITH DoALL CONTOUR SAWING

- *Miracle Method of Low-Cost Production*
- *World's Fastest Metal-Removing Process*

No metal-cutting process except Contour Sawing can do these two jobs, leaving cutouts and leftover stock intact. Other metal-cutting processes waste time reducing stock to worthless chips. Contour Sawing slices stock; leaves only a 1/16-in. kerf. Hundreds of superhard, razor-sharp teeth on a narrow band cut continuously through hard, tough metals as much as 30 in. thick. Apprentices soon do expert work—do not need years of experience.

Contour Sawing is an entirely new approach to low-cost production. Jobs done slowly by other methods are "naturals" for fast Contour Sawing. It magically reproduces parts usually cast or forged; turns out shop jigs and fixtures; makes cams; cuts sheet-metal stampings; patterns and templates.

Advantages of Contour Sawing shown in free booklet "DoALL Equals Ten Plus". Write for one if you want to see production zoom and costs sag!





HERE'S A

Class 3 Fit

YOU CAN DEPEND ON!

**... and that's only one
of many advantages of
P-K GROUND THREAD SOCKET SCREWS**

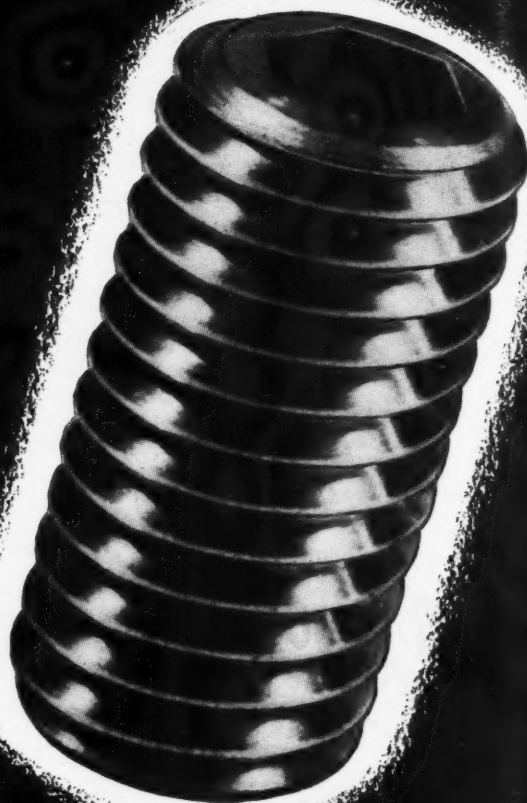
The comparator tells the story of unvarying dimensional uniformity of these years-ahead P-K Socket Set Screws. Used to check every lot from every machine in the battery of centerless thread grinders, the comparator shows up the extraordinary accuracy of thread contour and lead.

You don't need the comparator to see the many other advantages... the smooth, bright, gleaming finish that has none of the nicks, burrs, tool marks, hardening scale or imperfections common to ordinary cut thread set screws.

Watch any mechanic, skilled or unskilled work with P-K Ground Thread Socket Set Screws. You'll see how clean starting threads, consistent uniformity, and the way the screws "set up" to dependable security speed assembly work and improve production.

PROMPT DELIVERIES!

P-K's ample production facilities and mounting stocks make it possible to offer unusually prompt delivery on Socket Screws. Plan now to add their advantages to your assemblies!



Only PARKER-KALON offers
GROUND THREAD SOCKET SET SCREWS



**ANOTHER P-K FIRST
Size-Marked Gear Grip
SOCKET HEAD CAP SCREWS**

SIZE-MARK tells you the correct size at a glance. Eliminates guessing or "miking" to tell size when screws get mixed up. Saves time and errors at tool crib or on the job.

GEAR GRIP* prevents slipping and fumbling, especially when hands are oily. Makes fast fingers sure fingers.

* U. S. Pat. No. 126,409

Judge for Yourself

Send for this unique **SAMPLE KIT**. Compare. You'll agree your assemblies deserve the many advantages of these 3 far-reaching P-K improvements! Write today! Parker-Kalon Corp., 202 Varick St., New York 14.



SOLD ONLY THROUGH ACCREDITED DISTRIBUTORS
PARKER-KALON *Cold-forged* **SOCKET SCREWS**

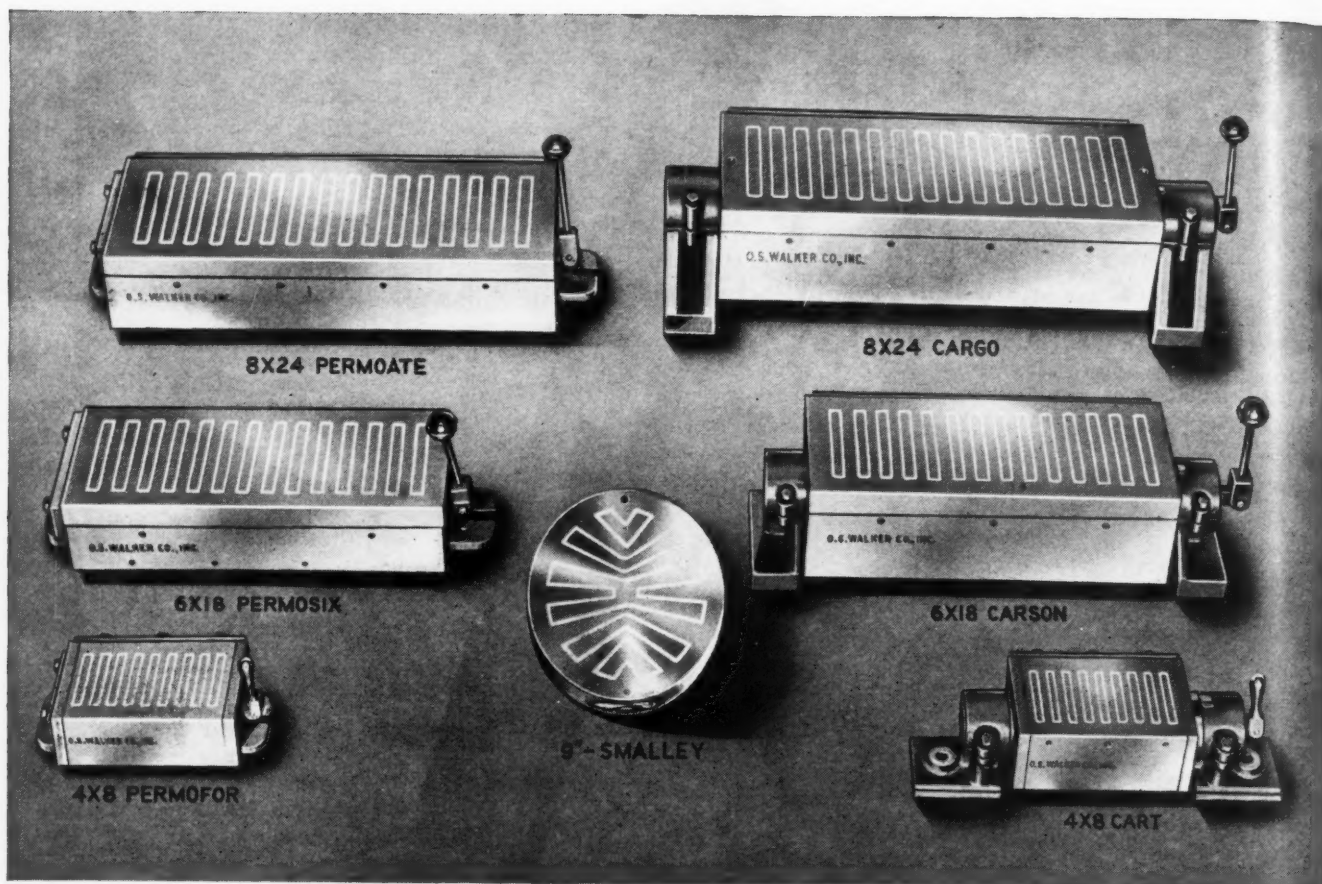
N!



**ACCURACY—
EVERY DAY
EVERY MONTH**

For uniform inspection results, you must have gages that retain their original accuracy . . . month after month. Our continual research and testing, constantly improved methods of manufacture, and rigid inspection are your assurances of uniform, long-lasting service from every Bath Precision Gage. John Bath and Company, Inc., Worcester, Mass.

BATH *Precision* **GAGES**



MEET THE WALKER

Permanent

CHUCK FAMILY!

Truly a credit to the O. S. WALKER CO.

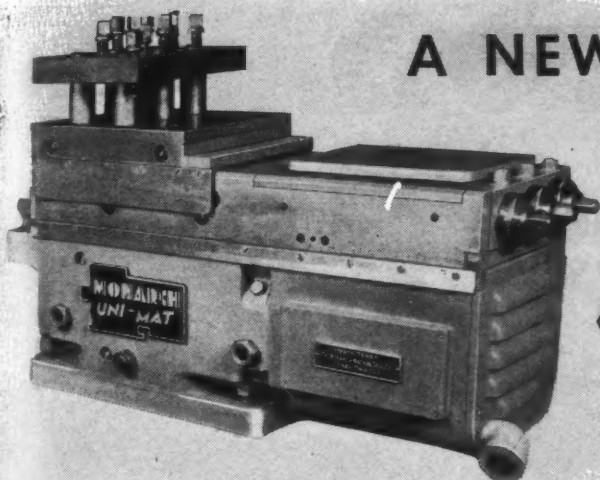
Over 60 years of chuck building, design, and engineering experience are incorporated into these "PERMOS."

Walker Chucks

WALKER ENGINEERS
invite you to present your
problems for solution at
no obligation.

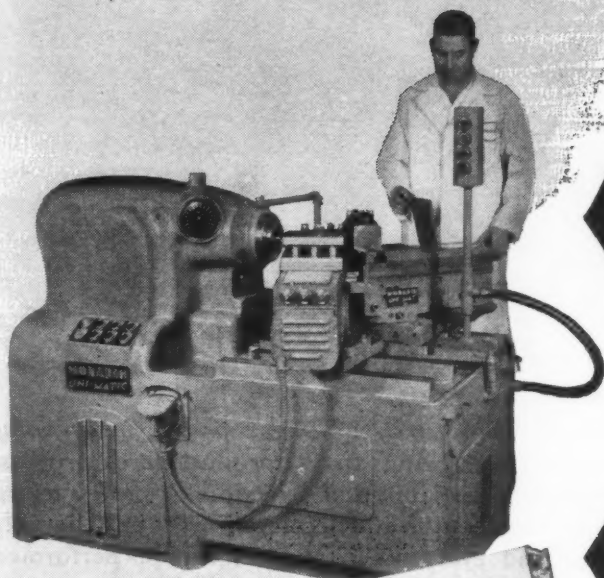
REMEMBER, there is a WALKER CHUCK
for every known application.

O. S. WALKER CO., INC. WORCESTER 6, MASS.



A NEW PRINCIPLE IN METAL TURNING—

THE UNI-MAT
(INDEPENDENT MOTOR-DRIVEN TOOL SLIDE)



A NEW MACHINE—

THE UNI-MATIC
(A UNIVERSAL AUTOMATIC TURNING MACHINE)

... and A NEW BOOK

WRITE FOR YOUR COPY



For chucking and fixture work—as small as 1" and as large as 16" diameter—the Uni-Matic combines sustained high-speed production with universal adaptability. Completely independent motor-driven tool slides (Uni-Mats) and preselected spindle speeds as high as 5000 RPM are tied into an electronically controlled cycle.

Get the full facts on these and many other features. Use the handy coupon below to write for your copy of our new 36-page book on the Uni-Matic—Monarch's answer to rising production costs.



Monarch
TURNING MACHINES

THE MONARCH MACHINE TOOL CO.
Sidney, Ohio

The Monarch Machine Tool Co.
Sidney, Ohio

Yes! I'd like a copy of your new 36-page book on the Uni-Matic.

Name _____ Title _____

Company _____

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STEPPLESS

Speed Changes



...from A-c. circuits!



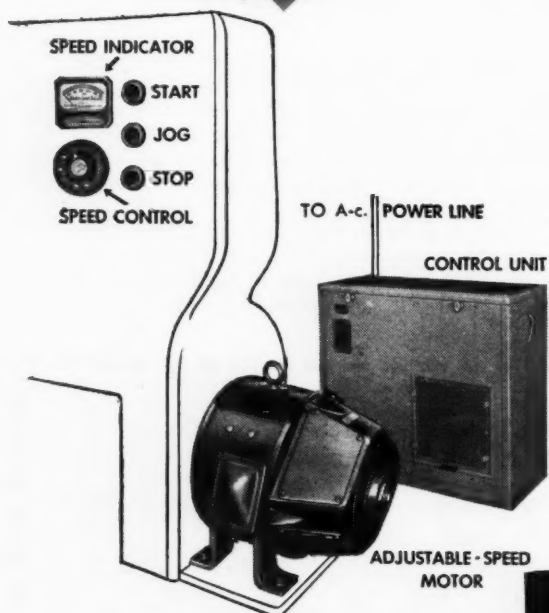
V*S, the *All-electric, Adjustable-speed Drive operating from A-c. Circuits*, brings to any production or processing operation an unlimited selection of *stepless* speed changes. Acceleration and deceleration are unbelievably smooth. And every V*S function can be performed automatically or manually, with all-electric control from nearby or remote stations!

Whatever flexibility of operation you need to increase quantity and quality of output can be provided the V*S way—simply, safely and economically. V*S control means instantaneous starts and stops—slow speeds for inching, threading or close inspection of work in process—maintenance of proper tension—reversal at any point desired. For more money-saving facts about the V*S Drive write for Bulletin 311.

RELIANCE ELECTRIC & ENGINEERING CO.

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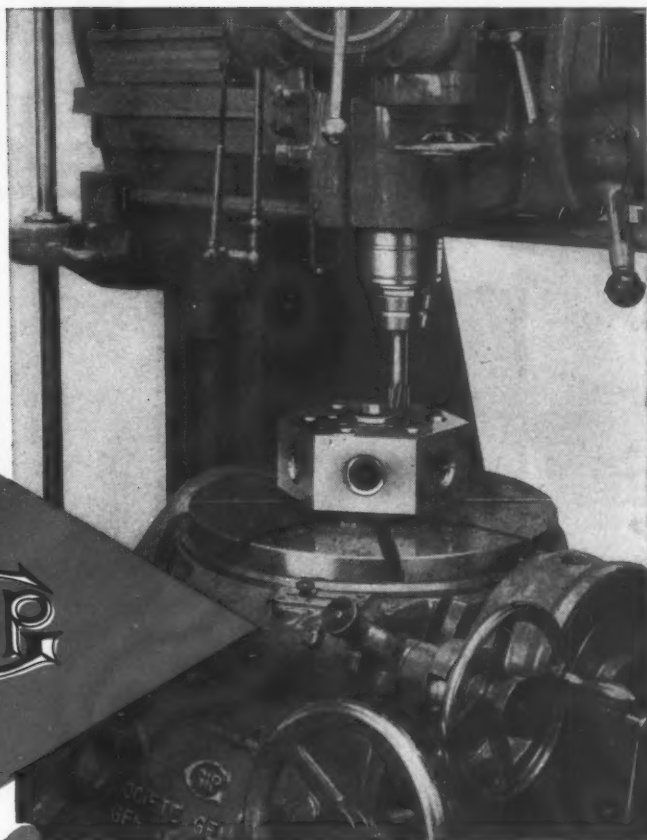
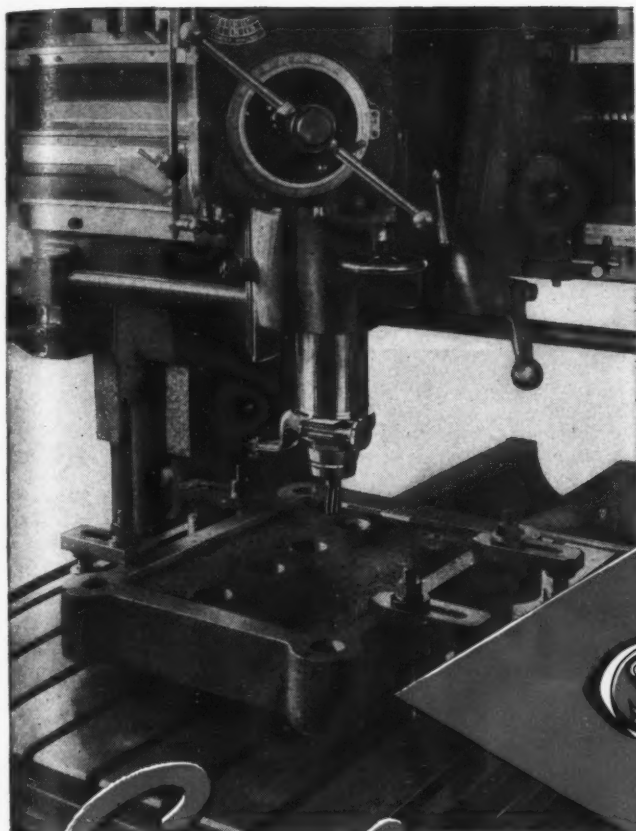
Appleton, Wis. • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Denver • Detroit • Gary
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*Conveniently-packaged, space-saving V*S Drives available in Rotating or Electronic Systems or a combination of both.*

RELIANCE^{A.C.} D.C. MOTORS

"Motor-Drive is More Than Power"



Exclusive

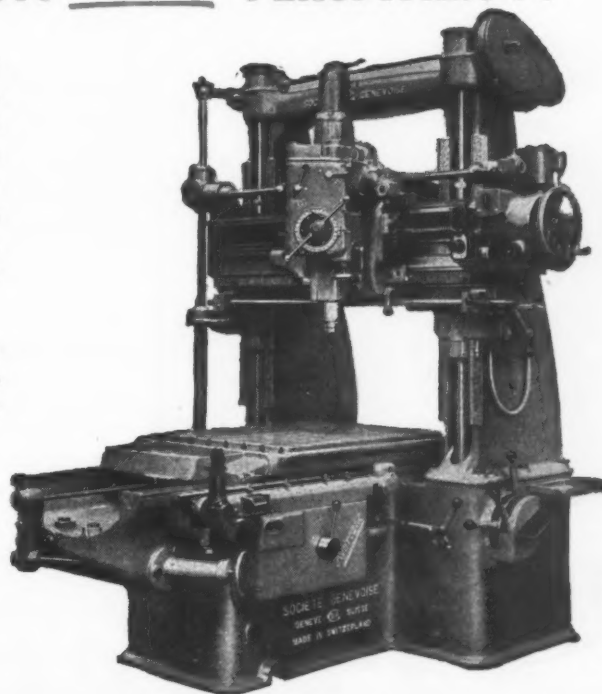
... PRECISION *and* VERSATILITY!

These two precision operations illustrate the extensive range of applications of the SIP HYDROPTIC-B, made possible by its exclusive adaptability for milling as well as jig boring and drilling. On the base plate for a piercing die, the milling as well as all the boring operations are performed by the HYDROPTIC-B Jig Boring and Milling Machine. On the second job, all six sides as well as the top surface of the turret head are machined in a single set-up, using the HYDROPTIC-B equipped with the SIP tiltable indexing table.

Combining hydraulic feeds for versatility and optical settings for the highest precision, the SIP HYDROPTIC-B Jig Boring and Milling Machine will answer your most exacting needs for toolroom and production operations.

SIP JIG BORERS RANGE OF TABLE SIZES

No. 2C	18" x 10 $\frac{3}{4}$ "
No. 3K	21 $\frac{1}{2}$ " x 15"
No. 4G	27 $\frac{1}{2}$ " x 23 $\frac{5}{8}$ "
Hydroptic (illustrated)	39 $\frac{1}{2}$ " x 32"
No. 5G	43 $\frac{3}{8}$ " x 32"



HIGH PRECISION MACHINE TOOLS

AND MEASURING INSTRUMENTS

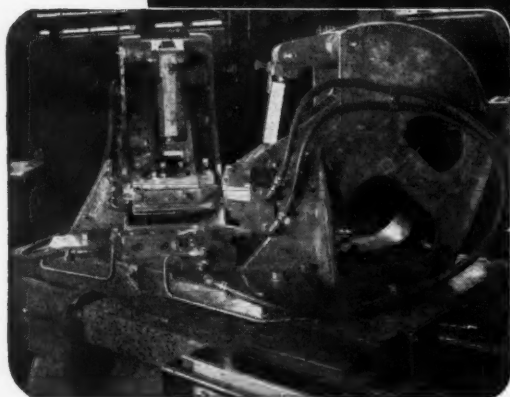
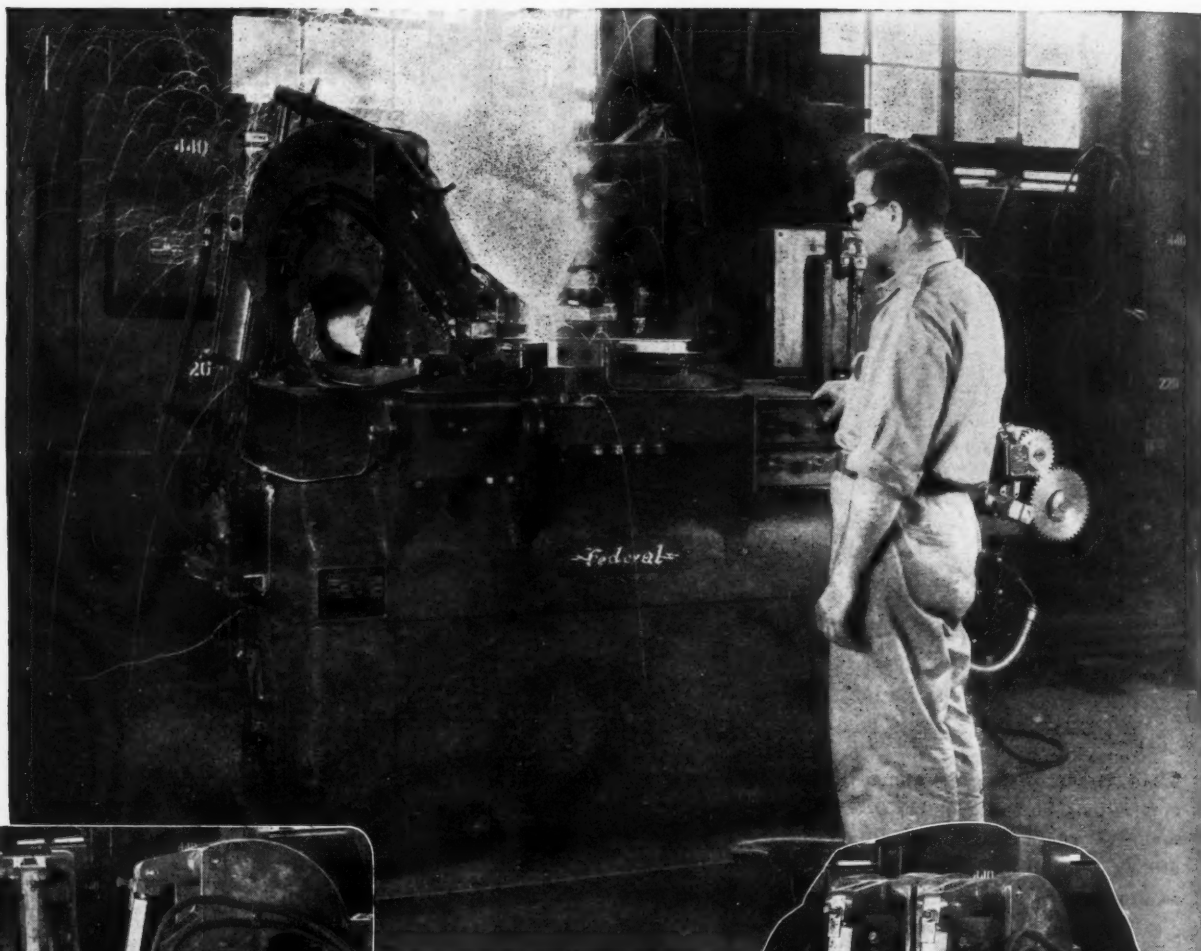
C O S A
CORPORATION



CHRYSLER BUILDING
New York 17, New York

Weld after
removing
flash

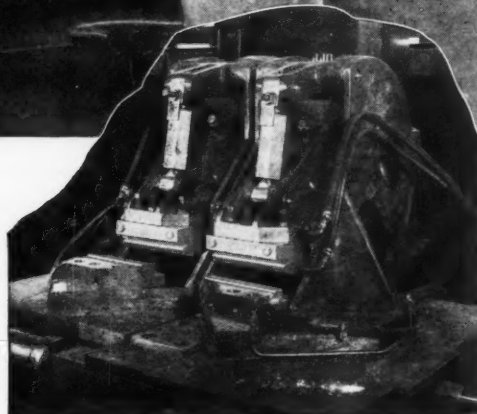
Flash-Welded Sash Hits New



**IT'S A FEDERAL F-4
SASH WELDER**

FLASH BUTT WELDING
SETUP →

← SETUP
FLASH MITRE WELDING



THE

Federal

SUBSIDIARIES

Sammer and Adams Co., Clev.; and—SPECIAL HIGH PRECISION MACHINES
The Warren City Mfg. Co., Warren—WARCO PRESSES and PRESS BRAKES

BULLETIN SP 346—Describing Federal
Spot, Flash, Projection, Seam and
"Gun" Welders is yours for the asking.

MACHINE

Aluminum (or Steel)

Production High on

Federal Welder

Weld before
removing
flash

The manufacture of strong, light-weight metal sash received a great impetus when Federal pioneered development of resistance welders to automatically weld butt or mitre joints of intricate cross sections.

It now takes about one second of welding time to flash a mitre joint stronger than the parent metal on the Federal F4 Flash Welder shown at left. It is typical of present day equipment which is helping fabricators of aluminum sash, frames and doors to attain a new high production output . . . speeding production of modern bus bodies, aircraft, feather-weight storm sash, and the like. This "four-in-one" machine, equipped with combination cams (a new feature) is adaptable to either aluminum or steel sash, with simple changes of gears and tap settings. In addition, it welds either mitre or butt joints. Alternate setups are made simply by rotating the clamp assemblies as shown in the smaller illustrations.

A few of the many special sections now being production welded in aluminum are shown at right. Production rates vary with the cross-section and method of loading, but all are in high out-put range that makes other methods unprofitable by comparison.

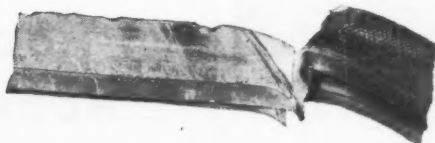
This, as the evidence shows, is the modern way to make metal sash of consistently good quality, free from distortion, with rigid unbreakable joints, which finish nicely. It is typical of the short-cutting, cost-saving methods possible in all sorts of metal fabrication with the use of Federal resistance welding. It's time to find out how this applies to YOUR production.

SEE US AT THE METAL SHOW

In making your plans for attending the National Metal Congress at Atlantic City, November 18 to 22, make a note of Exhibit No. F-125, on the main floor of the auditorium. Federal Welders and Warco Presses and Press Brakes will be shown there in a mighty interesting production demonstration.

NOTE THIS TEST:

The Joint Holds — Break Is In Parent Metal



Some of the special aluminum sections welded on Federal Sash Welders are here shown with test-cuttings to disclose the thoroughness of weld throughout the section. Note that in many cases the two sections mitre joined are not alike either in size or shape.



AND WELDER COMPANY

208 DANA STREET • WARREN, OHIO



Engineered Hole Location Service

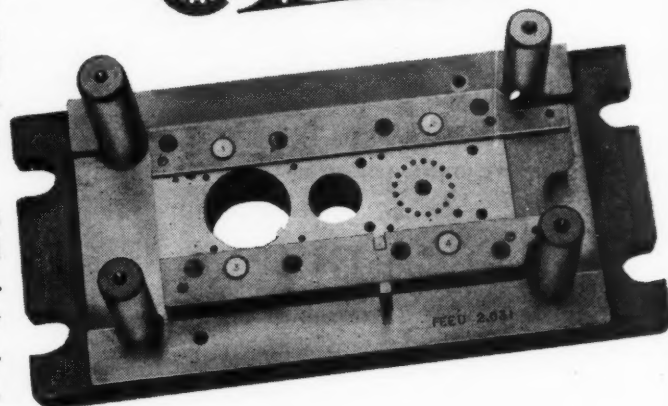
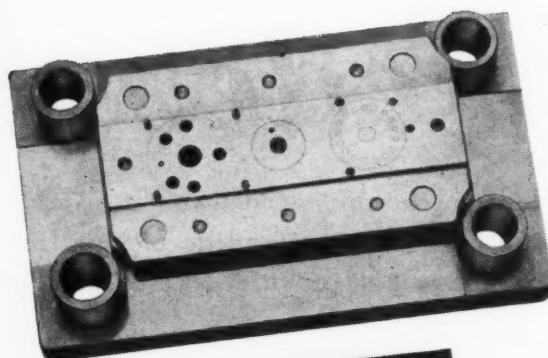
Prolongs Die Life

Electrical lamination stampings are tough on dies. With thin abrasive stock to be cut in enormous quantities, absolute uniformity in the small punch and die clearances is a "must."

Here's how the Moore Jig Borer and Moore Jig Grinder team up to pay dividends in your toolroom and assure 25% to 100% added die life:

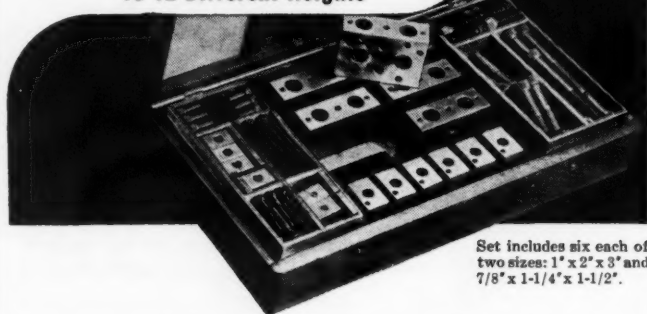
Both machines work to pre-engineered dimensions, enable all parts of the die to be made *to figures instead of to "fit."* Coordinate calculations, set up in the engineering department, can be used throughout in boring the soft pieces in the Moore Jig Borer and finish-grinding the hardened parts in the Moore Jig Grinder. And all parts of the die can be made concurrently by several toolmakers on an *interchangeable parts-and-assembly basis* instead of progressively as a one-man job.

Consider how this Engineered Hole Location Service built around the Moore Jig Borer and Moore Jig Grinder can lower your tool costs... increase the capacity of the toolroom... speed new dies to your pressroom. Then ask a Moore engineer to stop by and answer your questions in detail.



Something new in 3-way Parallel Set-Up Blocks

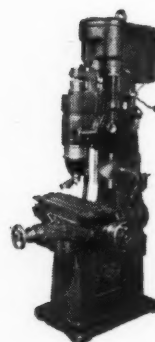
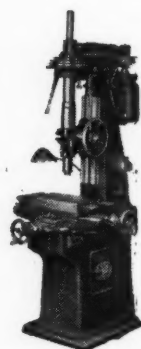
One Handy Set Speeds Set-ups To 12 Different Heights



Set includes six each of two sizes: 1" x 2" x 3" and 7/8" x 1-1/4" x 1-1/2".

This handy, compact set of Moore 3-Way Parallel Set-up Blocks takes the place of a large number of conventional parallels. Each block may be used in any of its three dimensions to build up to 12 different heights.

Spaced around the work-piece to provide support, parallel or perpendicular to working surfaces, they eliminate sagging, localize stresses and hold work rigidly throughout the machining operation. And they may be placed to avoid interference with holes being bored or ground. Write for descriptive literature.



MOORE JIG BORER
MOORE JIG GRINDER



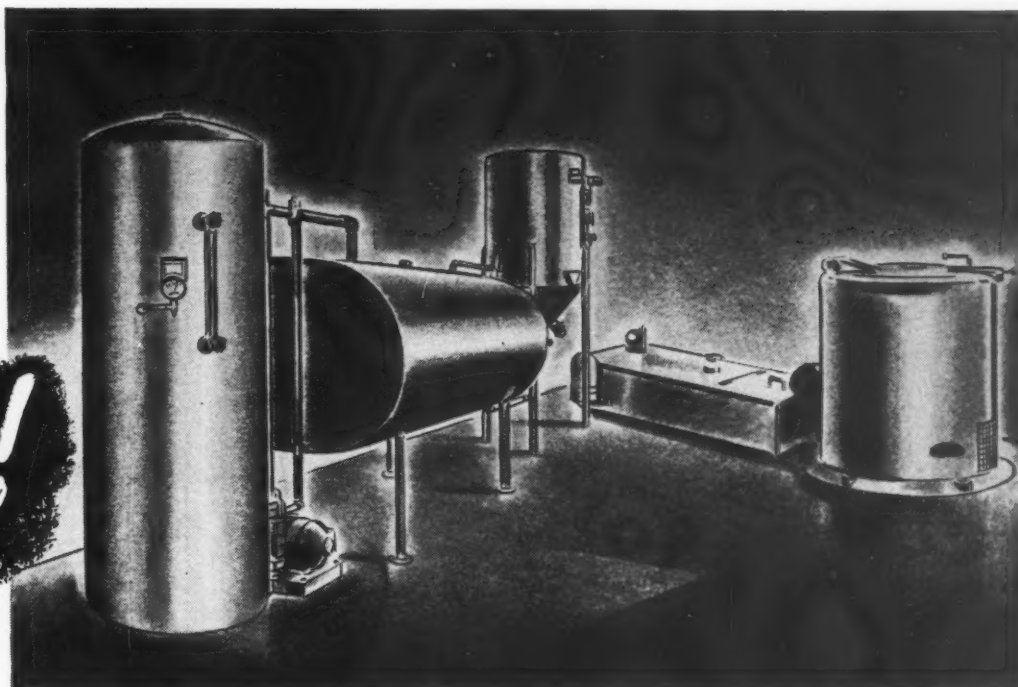
MOORE SPECIAL TOOL COMPANY, INC.
734 UNION AVENUE BRIDGEPORT 7, CONN.

A complete oil recovery and reconditioning plant including self-contained motor driven extractor. Many other types of centrifugal equipment available.

EXPORTERS

Most surplus property is available to the export market. Merchandise in short supply is withheld from export and if such items appear in this advertisement, they will be so identified by an asterisk.

SALE!



GOVERNMENT-OWNED SURPLUS OIL EXTRACTING AND RECONDITIONING EQUIPMENT

When war needs were heaviest, oil extractors and allied centrifugal equipment made vital conservations of metals and cutting oils. Today the emphasis has changed to the extra profits in oil recovery and reconditioning. It is good business to get the equipment you need to install a *complete* oil recovery and reconditioning plant in your own Factory or Machine Shop. Many of these machines are available in standard sizes, makes and models. Simply call your nearest W.A.A. office below, or use the coupon.

GOOD OPPORTUNITY FOR MAKERS AND DEALERS

If you make or sell centrifugal equipment, here is a real opportunity to make extra profits, and keep regular customers satisfied. You can buy back your own make equipment from these surpluses, and recondition or redesign it faster than you can produce new models. Your customers get the needed equipment sooner—and you keep their good will—and profits besides. For further information on purchases of this type, simply write or phone your nearest W.A.A. office below.

MAIL TODAY!

To War Assets Administration: I am interested in Oil Extracting and Reconditioning equipment of the following makes and sizes or Model No.

Make.....Size or Model No.....

.....

Please send me information on the following:

☐ Separators ☐ Centrifugal Filters

☐ Oil Purifiers

Name.....Tel. No.....

Firm.....

Address.....State.....

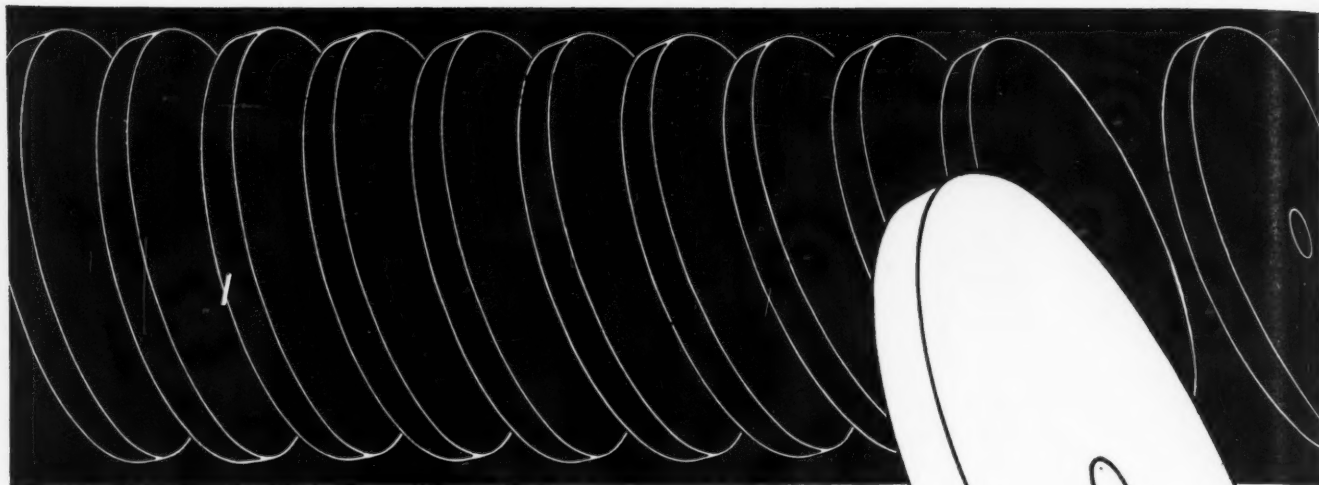
City.....

Although this material has been previously offered to priority claimants, 10% of the merchandise has been reserved to fill any further needs of priority claimants, including Veterans of World War II, who are invited to contact the Regional Office serving their Area with respect to this material.

468-3

WAR ASSETS ADMINISTRATION

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Fort Worth • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Oklahoma City • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane



Choosing THE ONE

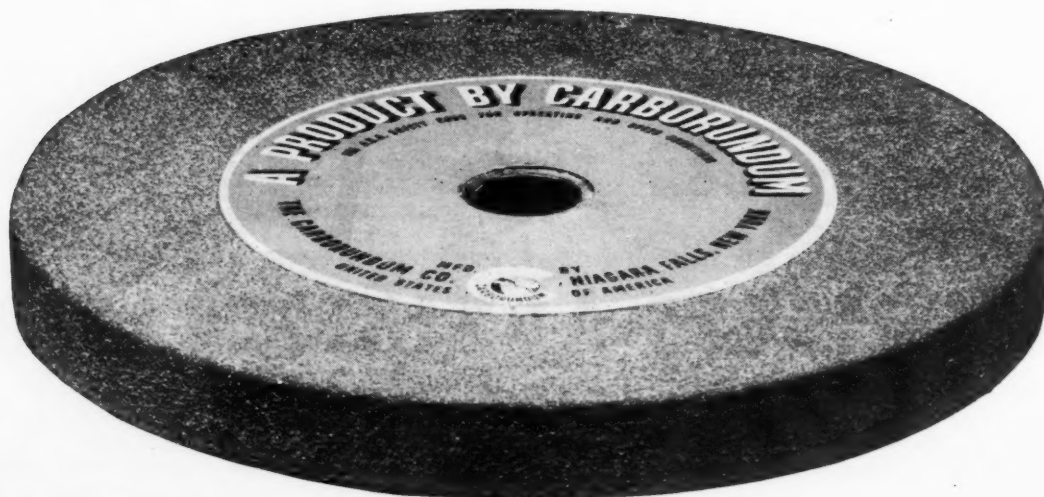


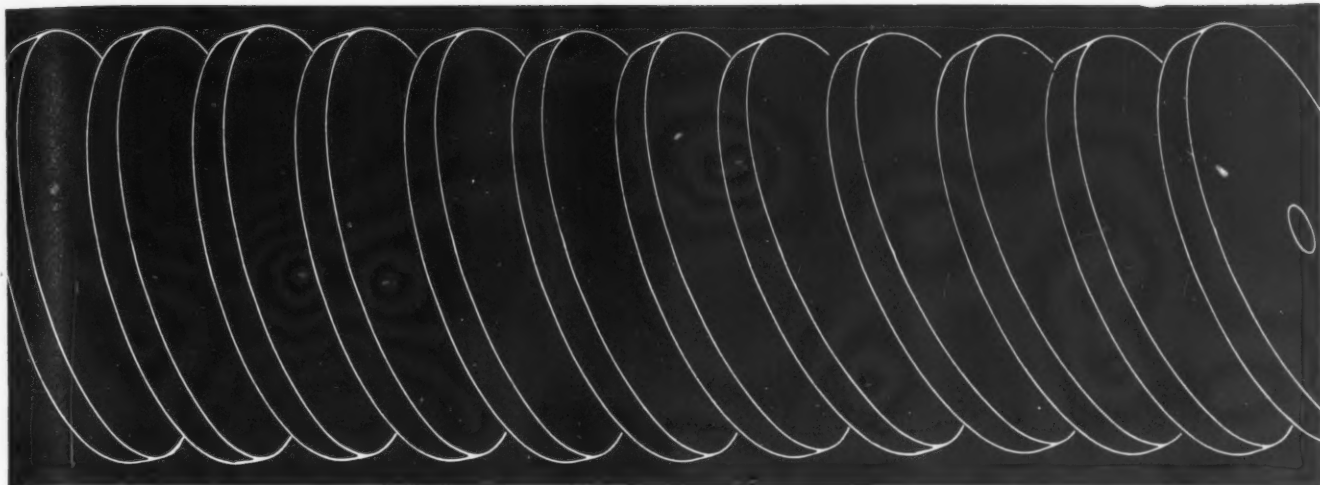
Actually, there are more than a million possible combinations of abrasive, type of bond, grade, grain size, structure, and shape in which a grinding wheel might be made. Seemingly, this vast number presents a terrific problem in the accurate selection of the one wheel best suited for any particular grinding operation. In practice, it is a relatively simple matter.

In the first place, your own experience quickly narrows the field to a relatively few wheels from which the final choice is made. And, it is in making this last decision where more and more top drawer production men depend on the advice and suggestions of an abrasive specialist.

Your CARBORUNDUM representative is always prepared to offer competent assistance in selecting grinding wheels that give better

*A good rule for good grinding... **CALL***





E in a Million!

grinding at minimum cost. His thorough analysis of your grinding operations provides a dependable double check on their efficiency. Often, he can offer a practical suggestion for improvement. For he is fully aware of the latest developments in abrasives and their application. What is more, his very business brings him in daily contact with a variety of modern grinding jobs.

Where the problem is especially difficult or

involved, he can call in one of our Abrasive Engineers. If necessary, the facilities and resources of the world's best known abrasive laboratories are available.

When you call in CARBORUNDUM, you receive cooperation that assures you of getting the most out of your grinding operations and abrasive wheels. The Carborundum Company, Niagara Falls, New York.

IN CARBORUNDUM

TRADE MARK

BONDED ABRASIVES

WHEELS

Silicon Carbide
Aluminum Oxide
Diamond

Cylinder Hones
Sticks, Stones & Rubs
Specialties

COATED ABRASIVES

Paper, Cloth and
Combination
Sheets, Rolls, Discs

ABRASIVE GRAINS AND COMPOUNDS

for:

Polishing
Lapping
Pressure Blasting
Finishing

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company

MACHINERY, September, 1946—337



WORCESTER PRESTEEL

Presteel Produces
an Unusual
Welded Flywheel



The flywheel shown here is an unusual stamped-welded assembly. It measures 7 inches in diameter, and must be filled with mercury before installation to provide the desired weight.

As the sectional view shows, the assembly is made up from several drawn shapes and requires both spot and autogenous welding to insure a mercury-tight closure. Presteel then precision-grinds the O.D. and end faces to provide perfect balance.

Such work requires more than ordinary press experience, making it "A Job for Presteel."

As you look forward to your future stamping problems which require skill and ingenuity plus unusual stamping facilities, think of Presteel.

WORCESTER PRESSED STEEL CO.

ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883

309 BARBER AVENUE, WORCESTER 6, MASS.

Representatives in Alexandria Virginia, Buffalo, Canton Ohio, Chicago, Denver, Detroit, Fort Worth, Indianapolis, Los Angeles, New York, Philadelphia, Syracuse, Toronto

harnessing **POWER** *to meet your needs*

You may need gears in quantities for the equipment you build. Foote Bros. can supply them.

You may require a giant gear 20 feet in diameter. Of course you look to Foote Bros.

It may be a standard speed reducer—worm or helical—in any one of a hundred ratios—again the answer is Foote Bros.

Perhaps your problem is one of excessive speed that only gears bordering on theoretical perfection can solve. Then Foote Bros. "A-Q" Gears can be designed to fit your needs exactly.

Or a Foote Bros. Power Unit may bring you a new answer to power application or control.

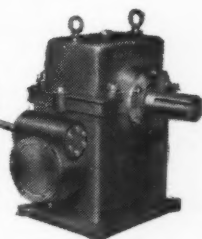
In fact, no matter what equipment you require to harness power to your needs, call Foote Bros.

FOOTE BROS. GEAR AND MACHINE CORPORATION
4545 South Western Boulevard • Chicago 9, Illinois



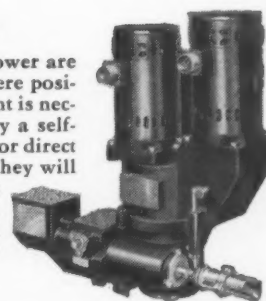
SPEED REDUCERS

The complete line of Foote Bros. Speed Reducers includes a wide range of sizes, types and ratios to meet practically every industrial need. Foote Bros. reducers are the accepted standard in many plants. Let our engineers furnish details on the type best suited to your needs.



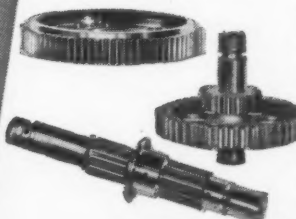
POWER UNITS

These compact packages of power are finding many applications where positive control from a remote point is necessary. They may be driven by a self-contained motor, flexible shaft or direct connection to power source. They will operate at high speeds and fit a minimum space envelope. Foote Bros. engineers will gladly aid in designing Power Units to fit your needs.



COMMERCIAL GEARS

Making gears has been Foote Bros. business for nearly a century. Manufacturers have long recognized that the production skill—the complete plant facilities of Foote Bros.—offer a quick, simple solution to any gear problem. Whether you require small gears on a production line basis or giants for a particular job, call Foote Bros.



"A-Q" (AIRCRAFT QUALITY) GEARS

This advanced type of gearing is produced for many applications, including Pratt and Whitney Aircraft Engines. These gears mark a new advance in design and manufacture. They permit operation at far higher speeds, save weight and permit quieter operation. Their compact design may aid your engineers in solving space problems.

Two engineering bulletins, one on "A-Q" gears, the other on Power Units, offer many suggestions on new developments in application of power. If you have not received copies, mail the coupon below.



FOOTE BROS.

Better Power Transmission Through Better Gears

Foote Bros. Gear and Machine Corporation
Dept. P, 4545 S. Western Blvd., Chicago 9, Ill.
Gentlemen: Please send me Bulletins on:

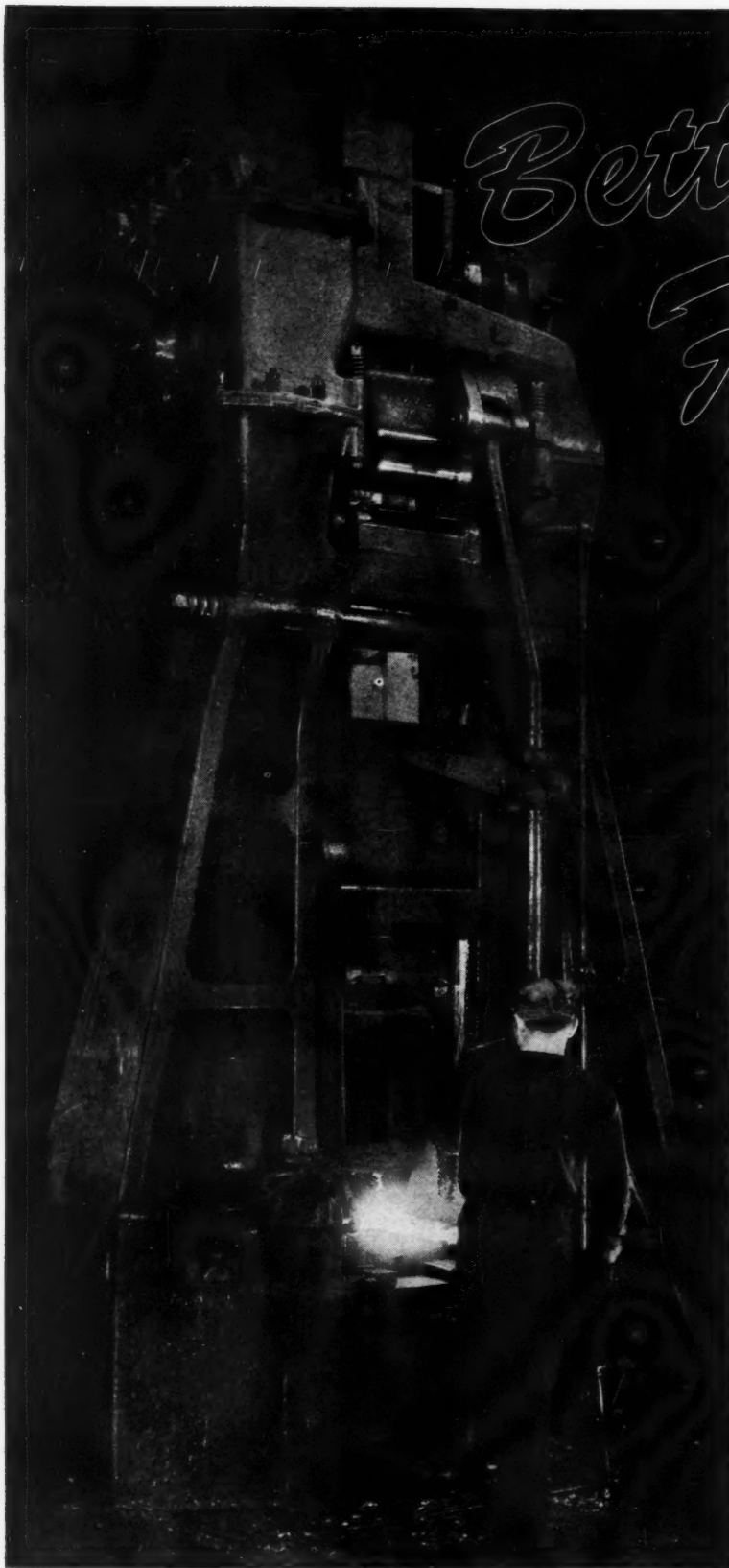
☐ Power Units ☐ Aircraft Quality Gears

Name.....

Firm.....

Address.....

City.....State.....



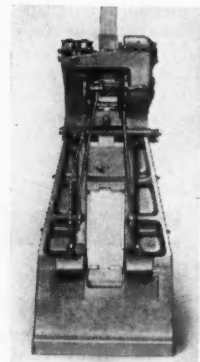
Better Drop Forgings

from Model J-2 **CHAMBERSBURG** **Board Drop Hammer**

Companies intending to make profits in these coming years must make them by cutting production costs. Labor costs are higher, therefore other costs must be reduced.

One way is to start with your drop forgings. Modern Chambersburg Board Drop Hammers will forge to closer limits, will forge more rapidly and require less maintenance.

Motor-driven for self-contained operation independent of shafting location, or belt-driven where belt-drive is more convenient.



Rear of Hammer showing Simplicity of Design.

Chambersburg Board Drop Hammers represent the up-to-the-minute, carefully considered essence of experience gained during nearly half-a-century of concentrated and continuous effort in the building of impact machinery.

Write for a copy of Bulletin 252-2

**CHAMBERSBURG
ENGINEERING CO.**

**CHAMBERSBURG
PENNA.**

CHAMBERSBURG
Builders of **IMPACT** *Machinery*

A-B-C'S OF HALLOWELL WORK BENCHES OF STEEL

A— AVAILABLE IN 5 DIFFERENT HEIGHTS, 7 STANDARD LENGTHS

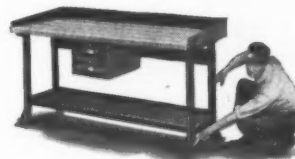
With "Hallowell" workbenches of steel, you can choose from about 1300 READY-MADE combinations. 5 heights and 7 lengths, interchangeable shelf, drawer and cabinet units give you the chance to pick out just the style bench that will fit your individual requirements.



1895C

B— ABSOLUTE STEADINESS

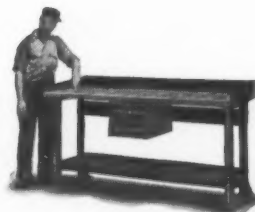
Flanged and ribbed steel leg construction insures that "Hallowell" Workbenches will stand firm and rigid without costly bolting to the floor. This also permits great flexibility in shop arrangements, as the benches can easily be moved about.



1916A

C— GREAT STRENGTH

Finest construction is your guarantee of extra-long wear, regardless of abuse. Tops stay smooth and serviceable . . . give you "lifetimes of wear."



1894C

Write today for the "Hallowell" Catalog of Shop Furniture. "Unbrako" and "Hallowell" products are sold entirely through distributors.

OVER 43 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 22 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

ARMSTRONG

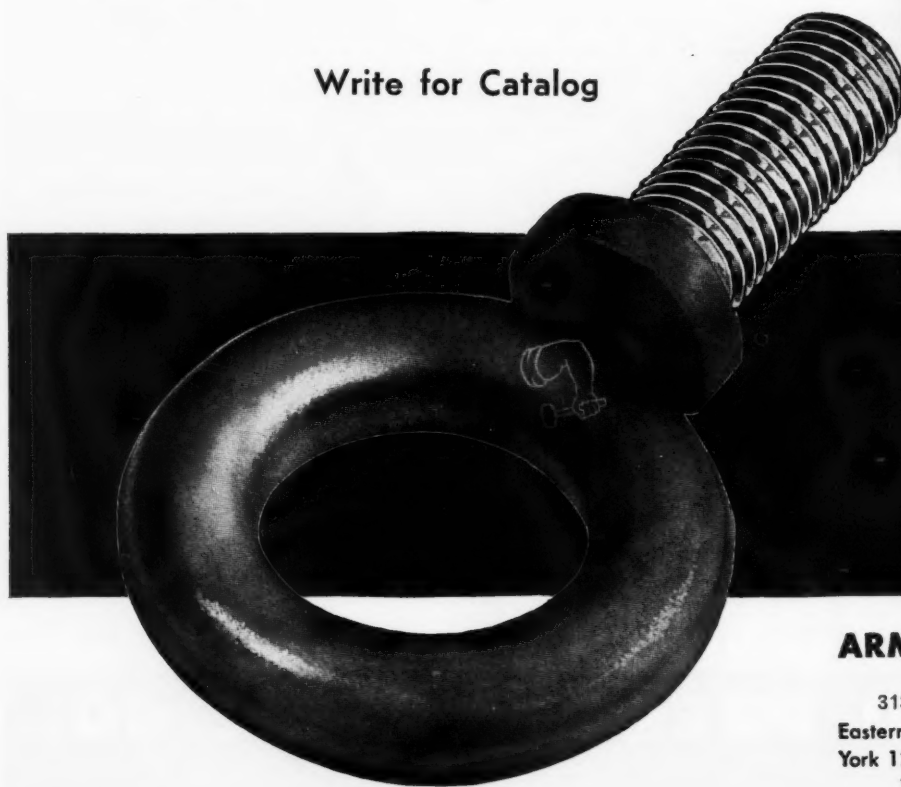
Drop Forged EYE BOLTS

They'll carry the load

Specify ARMSTRONG Drop Forged EYE BOLTS for extra strength — correctly engineered proportions, forged-in quality, uniformity of design in all sizes, and the best mild steel, heat treated to increase tensile strength.

ARMSTRONG Drop Forged EYE BOLTS, as built to tool standards, are not hammered out in "tonnage forgings." They come in plain or shoulder patterns, blank or threaded, in 14 sizes, shank diameter from $\frac{1}{4}$ " to $1\frac{1}{2}$ ", inside diameter of eye $\frac{3}{4}$ " to $2\frac{1}{2}$ ". They will always carry their rated load safely.

Write for Catalog



ARMSTRONG

<p>TOOL HOLDERS For Every Operation</p> <p>Turning Cutting Off Side Boring Threading Knurling Shaper Planer Screw Machine Turret Lathe Slotted Sets in Metal Cases</p> <p>CUTTERS All Types for Tool Holders</p> <p>High Speed Bits High Speed Formed Thread Cutters Armide (Carbide Tipped) Bits Armaloal (Cast Alloy) Bits Armaloal (Cast Alloy) Blades</p> <p>WRENCHES A Complete Service Both Carbon and Alloy Steel</p> <p>Engineers Offset Angle Thin (Check Nut) "S" Heavy and Light Car Set Screw Tool Post Box - 11 Types Construction Structural Spanners Socket (Straight Shank & Offset Pattern) Tappet Multi-Type Detachable Socket Driving Units—All Types Ratchets Sets Specials</p> <p>MACHINE SHOP SPECIALTIES Exclusive Features</p> <p>Drill Holders Drill Drifts—Safety & Plain Improved Lathe Tool Posts Quick Acting Drill Vises Ratchet Drills Drilling Posts</p>	<p>LATHE DOGS Square Head or Safety Type</p> <p>Bent Tail Straight Tail Heavy Duty Clamp Type Milling Machine</p> <p>"C" CLAMPS For Every Requirement</p> <p>Heavy Duty Medium Service Deep Throat (Light Service) Tool Makers' Machinists</p> <p>HOLD-DOWN and SET-UP TOOLS All Types and Sizes</p> <p>T Slot Bolts, Nuts & Washers Bracing Jacks Vertical Jacks Planer Jacks Strap Clamps</p> <p>KNURLS Precision Hob-Cut</p> <p>14, 21 and 33 Pitch Diamond Pattern Straight Line Full Face Standard Face</p> <p>EYE BOLTS Proof Tested—Dependable</p> <p>Plain Shoulder Blank or Threaded Special Lengths</p> <p>ARMSTRONG BROS. PIPE TOOLS</p> <p>Pipe Threading Tools Ball Threading Tools Hinged Pipe Vises Chain Pipe Vises Pipe Cutters Ratchet Pipe Broomers Pipe Cutter Wheels</p> <p>ARMSTRONG BROS. CHAIN TONGS For Pipe and Fittings</p> <p>Single End Jaw Double End Jaw With Flat Link or Cable Chain</p>
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ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"

313 N. Francisco Ave., Chicago 12, U.S.A.
Eastern Whse. and Sales: 199 Lafayette St., New York 12, N. Y.
Pacific Coast Whse. and Sales Office: 1275 Mission St., San Francisco 3, Calif.

Many difficult problems of design and fabrication have been solved by **HAYNES**

PRECISION CASTINGS

1. **Quality Alloys** having an unusual combination of properties can be readily precision-cast. Parts cast from HAYNES STELLITE alloy, HASTELLOY alloy, and various stainless steels are now available.
2. **Small or Mass-Production Quantities** of shapes difficult to obtain by other methods of manufacture at reasonable prices can be produced by precision casting.
3. **Improved Designs** result because parts can be engineered for performance rather than convenience of fabrication.
4. **Interchangeability of Parts** is assured, because HAYNES precision castings are uniform in quality, size, contour, and finish.
5. **Intricate Shapes, contours, and thin edges** are consistently reproduced. Internal and external threads, shoulders, and cored holes can be produced.
6. **Improved Metallurgical Properties** and sound, dense castings mean long life of stressed parts operating at high temperatures.
7. **Smoother, Cleaner Surfaces** than those generally obtained by conventional casting methods are possible.

For more complete information, write for the booklet, "HAYNES Precision Castings."



Here Are Some Samples of HAYNES Precision Castings in Use Today.

Haynes Stellite Company

Unit of Union Carbide and Carbon Corporation



General Offices and Works, Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—New York—San Francisco—Tulsa

The registered trade-marks "Haynes," "Haynes Stellite," and "Hastelloy" distinguish products of Haynes Stellite Company.

HAYNES

TRADE-MARK

alloys

ROGERS

Perfect "36"

VERTICAL TURRET MILLS

PRICED

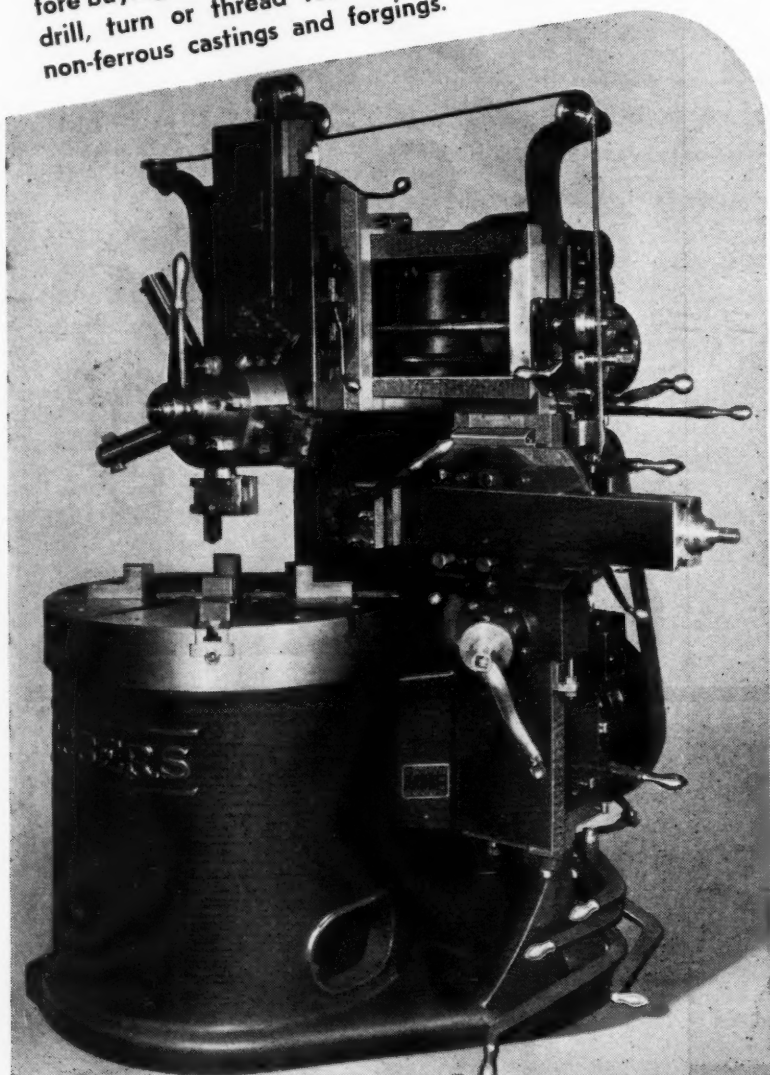
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QUICK "WRITE OFFS"

Only \$6850.

F. O. B. ALFRED, N. Y.

It pays to check with Rogers before buying any equipment to bore, drill, turn or thread ferrous and non-ferrous castings and forgings.



Reasonably priced to be quickly written off your books. Pay for themselves quicker by new efficiencies, too.

A WORD OF WARNING—be sure you don't pay more for a used machine than for a NEW ROGERS.

Rogers simplicity of design assures—

**LOW INITIAL COST
LOW OPERATING COSTS
LOW PRODUCTION COSTS**

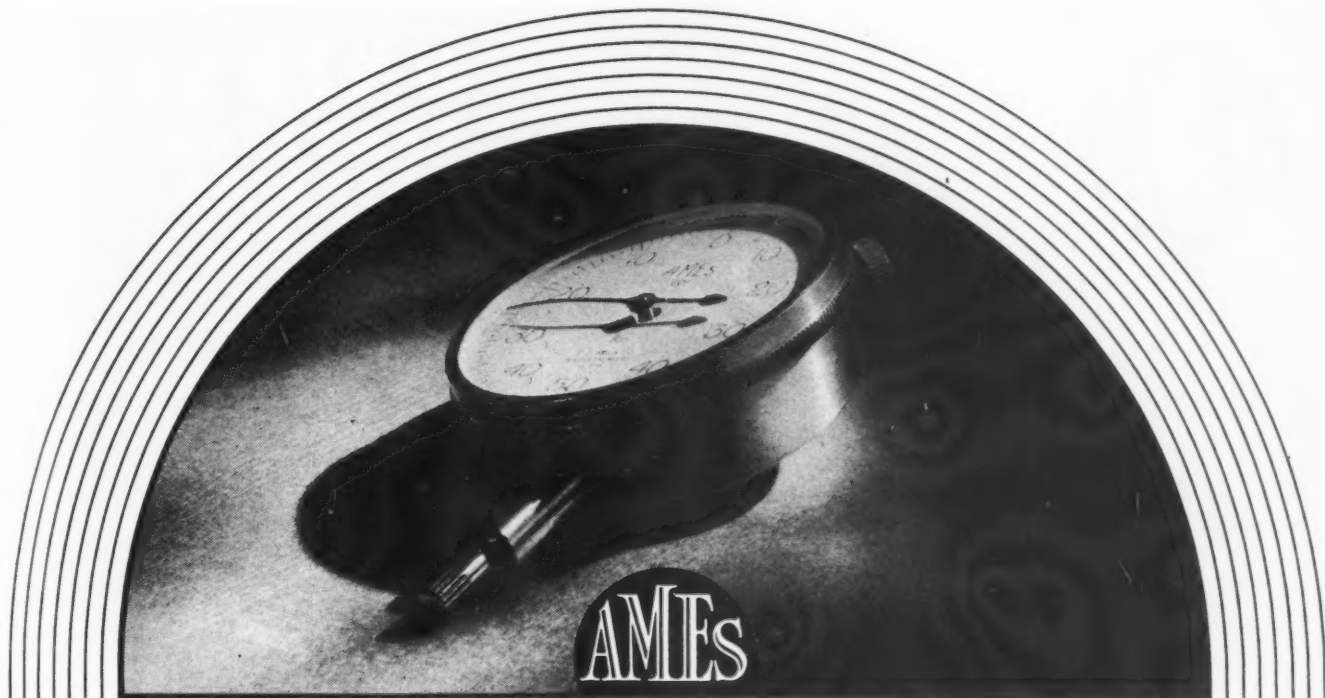
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**ROGERS
MACHINE WORKS, INC.**

Sales Office: 1809 Elmwood Ave., Buffalo 7, N. Y.

Factory: ALFRED, NEW YORK

— Knowing How Since 1885 —



FOR MILLIONS OF READINGS!

In Dial Indicators you should insist on sensitivity, accuracy, *and long life* — the only kind of indicators that AMES has been making for 50 years.

Many features of AMES design are exclusive. Only the best, the most-lasting materials are used. Add expert craftsmanship in every particular, and you have AMES Indicators . . . that will outlast any other indicator you can buy—at any price. Send for illustrated Catalogue.

Representatives in principal cities **B. C. AMES CO.** 27 Ames Street
Waltham 54, Mass.
Manufacturers of Micrometer Dial Gauges and Micrometer Dial Indicators

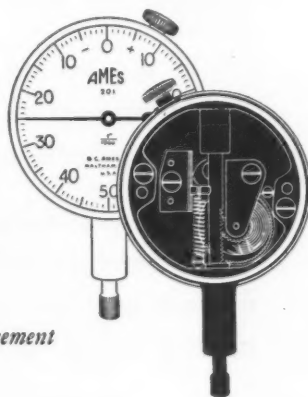
4 Sizes—60 Models

English or Metric Measure

Balance or Continuous Dials

Plain or Compound Movement

Many Graduations and Ranges



Forged Brass Case and Stem

Hardened Steel Staffs and Pinions

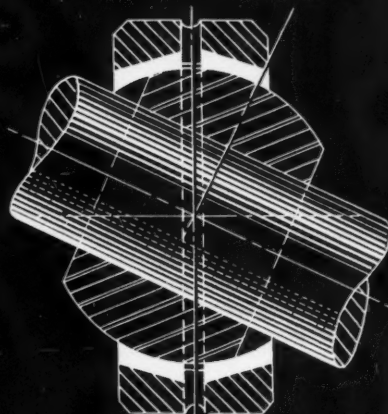
Forged Wheel Supports

Hardened Steel Guidepin and Guide Block

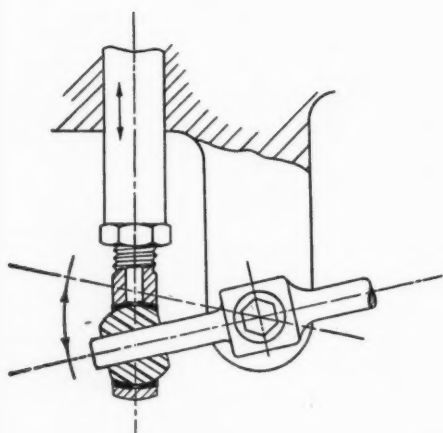
Burnished Hardened Bearings



UNIBAL SPHERICAL BEARING ROD ENDS



The HEIM Unibal Bearing and Spherical Bearing Rod End Corrects Misalignment All Ways



Heim Unibal Spherical Bearings and Rod Ends are built to carry heavy loads. There is only one ball with large contact or surface supporting area. Because of this large area, they are not subject to false brinelling. The ball is made from SAE 52100 steel hardened and ground for maximum strength and long wear.

There are myriad applications for this simple but highly efficient bearing or rod end in your products. We illustrate a very simple one.

Present your problem to our Engineering Department. Send us blue prints of your present rod end or bearing construction, and we will help you in improving it and, at the same time, reduce your cost.

PLEASE WRITE FOR

CATALOG NO 11

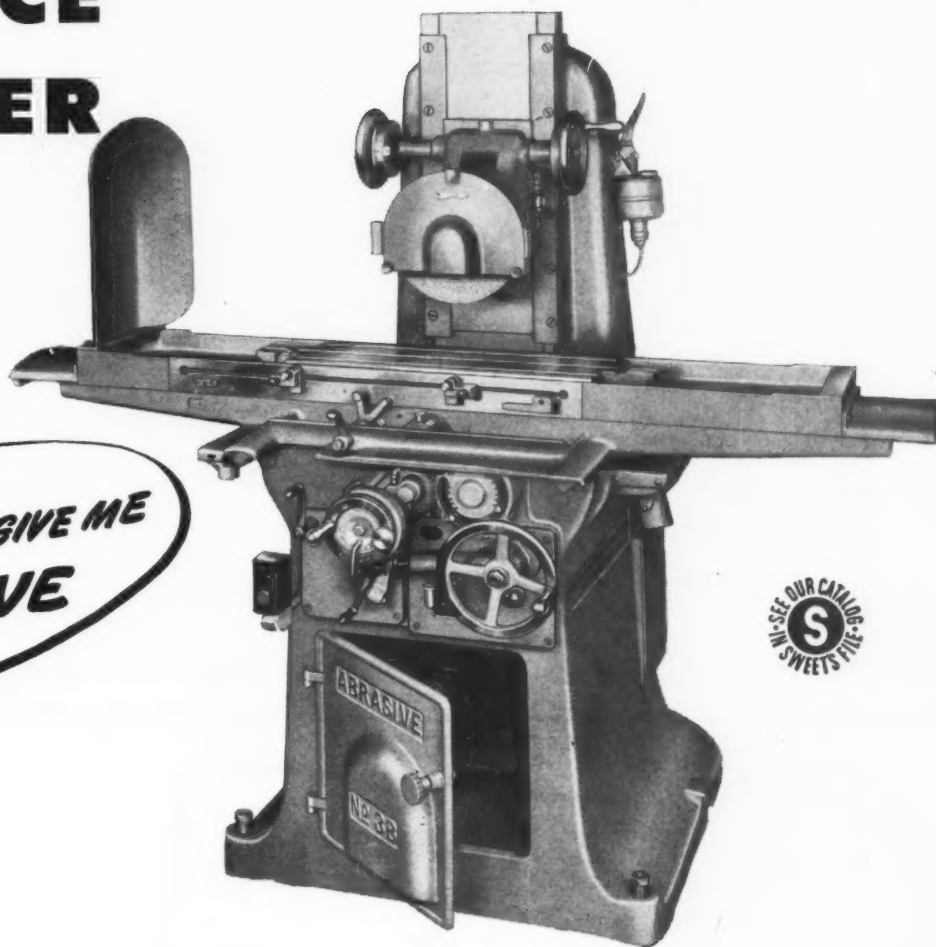
THE HEIM
FAIRFIELD



COMPANY
CONNECTICUT

ABRASIVE 3-B

SURFACE GRINDER



FOR CLOSE LIMITS GIVE ME
AN ABRASIVE



The ABRASIVE 3-B is the "pet" of the shop. It gets the most difficult, precise jobs

— and it delivers perfect work on time, every time. Fully automatic, built for precision work on a production basis, the 3-B is the last word in grinding accuracy and efficiency. Its many features include: one-piece, heavily ribbed bed casting; motorized spindle mounted in massive head to provide more power and minimize vibration; vertical feed dial accurately graduated to .0001"; hydraulic shock absorber to cushion table reversal.

Write for complete Bulletin

ABRASIVE MACHINE TOOL COMPANY
EAST PROVIDENCE 14, RHODE ISLAND

SPECIFICATIONS

Work Capacity:

24" long 8" wide 12" high

Wheel Size 10"

Table Size Overall 59"x10 1/2"

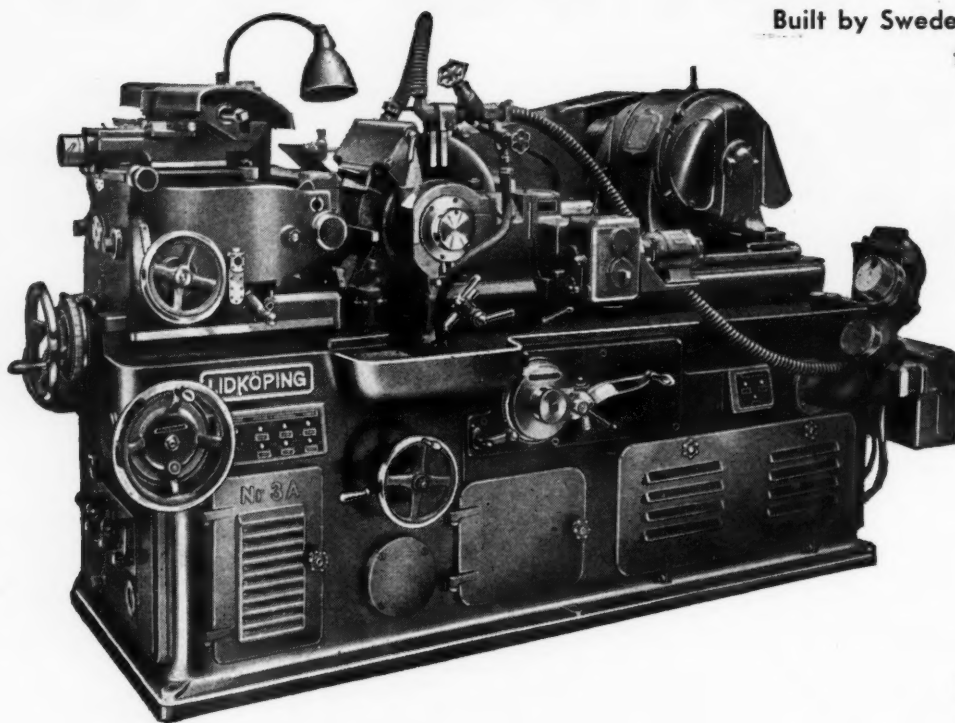
Net Weight 2670 lbs.

For information regarding Abrasive Machines on the Government Surplus Tool List, send us the serial number of the machine. We will endeavor to provide attachments, accessories and repair parts as desired.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

SWEDISH **LIDKÖPING** CENTERLESS GRINDERS



Built by Sweden's oldest and largest machine tool factory. Hundreds in use.

Most powerful.

Many sizes available for grinding pieces up to 14" diameter, 23" long; for grinding bars up to 6" diameter and 25 ft. long.

Large variety of attachments available for:

Through-Feed
In-Feed
Profile
Taper and
Shoulder Grinding

For detailed catalog write to:

TRIPLEX MACHINE TOOL CORP., 125 Barclay Street, New York 7, N. Y.



CONTROLS

"at Your Fingertips"

If you are debating whether to buy a Surface Grinder let us help you to decide. These are a few points on the REID.

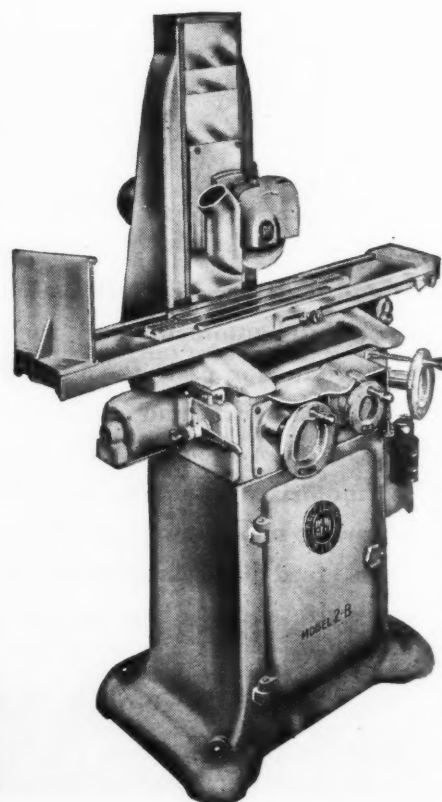
- **HEAVY, BALANCED CONSTRUCTION**
(Eliminates Vibration)
- **CENTRALIZED FINGERTIP CONTROL**
(All Controls at the Apron)
- **ALL WAYS ARE HAND SCRAPPED**
(Super Accurate Alignment)
- **ALL SHAFTS HARDENED AND GROUND**
(For Maintained Accuracy)
- **ROLLER AND TAPERED BEARINGS**
(Also Oilite Bushings)
- **EXTRA LONG WEARING QUALITIES**
(Dependable at All Times)
- **PRECISION BUILT FOR PRECISION**
(Designed for Today's Demands)

ILLUSTRATED IS THE REID MODEL 2B ALL ELECTRIC POWER-FEED.

The Reid Model 2-C Hand-Feed also is an Exceptionally Fine Machine for Tool, Gage, Die and Certain Production Grinding.

**MACHINES EQUIPPED FOR WET GRINDING IF REQUIRED.
EXCELLENT DELIVERIES.**

*Distributors Conveniently Located in All Sections.
Write Dept. B for Illustrated Bulletin and Prices.*



REID BROTHERS COMPANY, INC.
BEVERLY MASSACHUSETTS



The **KEY** TO GREATER PRODUCTION

OLIVER 510 DRILLPOINTER

The precision workmanship produced by the Oliver 510 Drillpointer has long been realized by skilled mechanics. Oliver has perfected the theory that machine sharpened twist drills means more efficient production. Thus, a properly machine ground twist drill will cut faster, last longer and produce more holes per grind.

Oliver's 510 Drillpointer covers the entire range of drills from 1/4" to 3". Its variable clearance and point angles provide drill points that give more holes per grind.

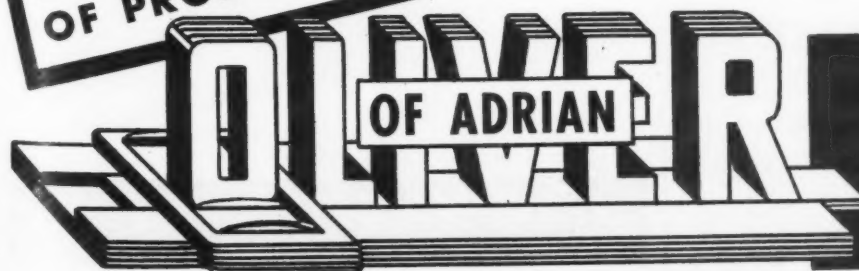
Because each drill point is like every other drill point, uniformity is maintained. You will find excessive costs of scrap materials and drills will be eliminated when the Oliver of Adrian Drillpointer is used.

Test the "Oliver Point" in your own shop. Remember, skilled mechanics always insist on Oliver products.



**IMPROVE YOUR TOOLROOM
IT'S THE BACKBONE
OF PRODUCTION**

OLIVER
INSTRUMENT CO.
1410 E. MAUMEE ST.
ADRIAN, MICH.



Write for Illustrated Literature

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL
POINT THINNERS—TEMPLATE
TOOL GRINDERS—FACE MILL
GRINDERS—DIEMAKING MACHINES

For this wheel

Use this dresser



FOR DRESSING large and coarse grinding wheels—where you want fastest possible cutting action—use Desmond Huntington dressers. Five types of handles and three sizes of cutters meet the full range of wheel dressing requirements. Bushings, spindles, washers and cutters are all carefully hardened. In every detail, these tools uphold Desmond's guar-

antee of complete satisfaction.

There's satisfaction, too, in knowing that Desmond makes the only complete line of grinding wheel dressers and cutters available—each item designed for proper cutting action on its particular job—to give you maximum service from your grinding wheels. Write for complete catalog and the name of your nearest jobber.

THE DESMOND-STEPHAN MFG. CO., URBANA, OHIO

Desmond

the only complete line of grinding wheel
DRESSERS & CUTTERS



350—MACHINERY, September, 1946



ALWAYS FRESH CUTTING
EDGES *without* RESETTING

JKS READYSET DIAMOND TOOL

For straight dressing, the JKS Readysset Diamond Tool offers you the important advantage of eliminating resetting. A carefully selected, elongated type of stone is set for its life in a specially designed diamond holder that permits the matrix to be ground slowly away as the diamond wears. This JKS setting is guaranteed to hold the stone until its usefulness is outlived. Whenever a flat develops, fresh points and cutting edges are quickly obtained by a simple turn of the tool . . . it can be repeated and repeated until the stone is consumed.

J. K. SMIT & SONS, Inc.

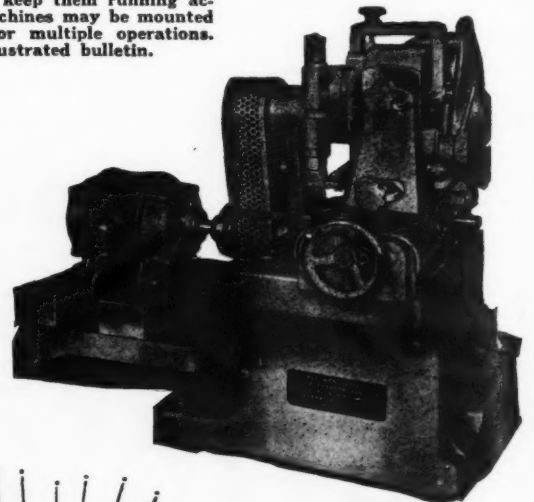
157 Chambers St., New York 7, N.Y.



• GET any grade of finish you desire on round tubes, rods, bars, etc.—at fastest feeds and lowest costs—with "PRODUCTION" No. 101 CENTERLESS FEED POLISHING MACHINES! Set the patented feed for forward, reverse or neutral . . . vary the speed of feed; an index dial shows its setting at all times . . . release work instantly; work support, of felt, fibre or steel, is always in correct position for all diameters from 1/4" to 6". Use any grade of polishing or buffing wheel; built-in truing device trues wheels while in motion; heavy wheel mounting, triple vee-belt drive and self-aligning bearings keep them running accurately. Machines may be mounted in tandem for multiple operations. Write for illustrated bulletin.

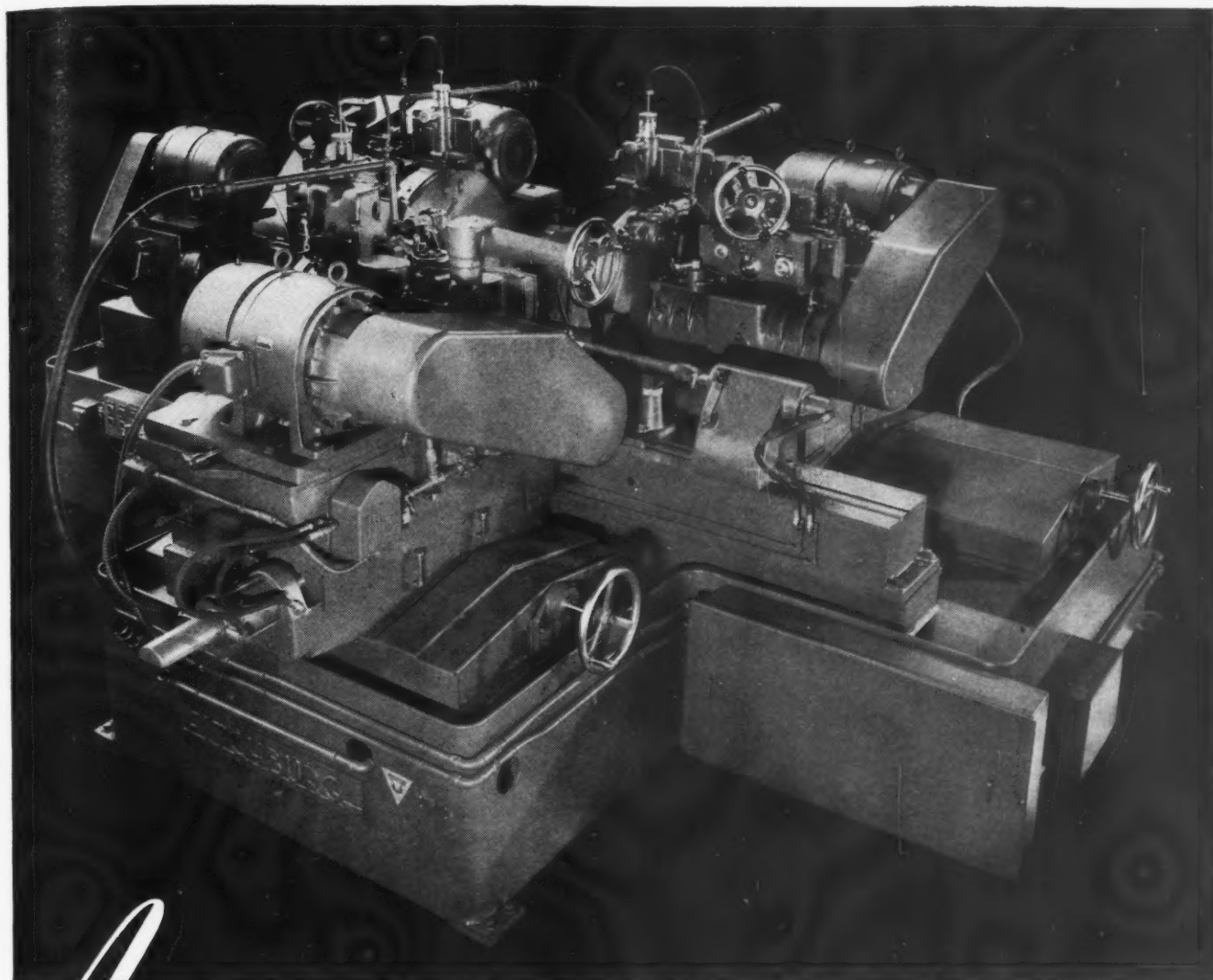
Fine

—AND FAST!—
CYLINDRICAL FINISHING



Production
MACHINE COMPANY

GREENFIELD, MASS. U.S.A.



Again THREE HEADS ARE BETTER THAN ONE

... Because Fitchburg engineers have combined three standard Bowgage Grinding Heads on a special base to plunge-cut grind three spottings on a 96" torsion spring for tanks. All three dimensions are ground at the same time—and within the time of the longest single grinding operation—and in one handling, with the consequent saving in time and reduced danger of spoilage.

Get the complete facts. The open engineering mind instantly makes a favorable comparison between Fitchburg automatic precision grinding and any other equipment on the market! Install the Fitchburg method now and use your "Head" to cut costs and speed production.

Send your blueprints for our engineers' recommendations. There will be no obligation.

A triple-head Fitchburg Grinder like this may be converted into one double-head grinder and one single-head grinder, or three single grinders. Heads are interchangeable—save your investment.

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U. S. A.
Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

"AVOID DELIBERATE RUIN OF MACHINERY"

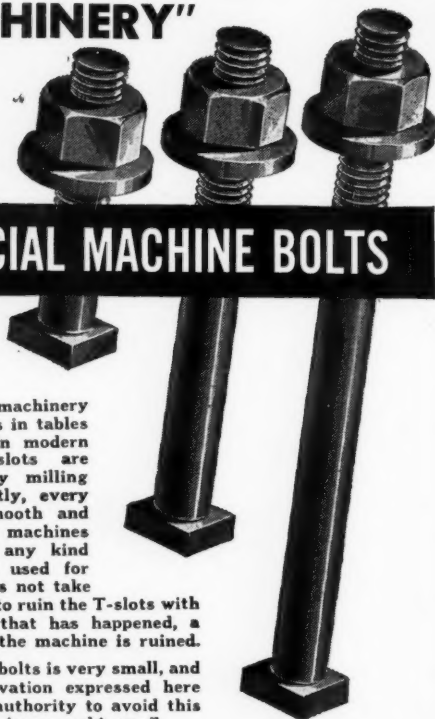
SPECIAL MACHINE BOLTS

From a Letter to
Tool Engineer
January, 1945

"Most metal working machinery is provided with T-slots in tables for fastening work. In modern production these T-slots are completely finished by milling or planing; consequently, every surface is finished smooth and square. But, when the machines are put in operation, any kind of hodgepodge bolt is used for fastening work. It does not take long use of a machine to ruin the T-slots with such bolts, and after that has happened, a most essential part of the machine is ruined.

"The cost of proper T-bolts is very small, and I hope that my observation expressed here will reach the men in authority to avoid this deliberate ruin of American machinery."

Boyar-Schultz T-Slot Bolts are made from upset forgings of heat treated alloy steels. Machined heads are square with bodies to present a clean, flat surface to the T-slot. Threads are carefully cut. For best results, use Nuts and Washers made for use with Boyar-Schultz Special Machine Bolts.



COPPER HEAD LAPS



BOYAR-SCHULTZ Copper Head Laps

... Pay for themselves in time saved. They work fast; they never wear out. The only wearing part is the replaceable sleeve. Sleeve adjustment feature permits maintaining correct lapping size till worn out and replaced with a new sleeve. Costly tool room time is saved by using Boyar-Schultz Copper Head Laps. Available from stock in standard sizes $\frac{1}{8}$ " to $2\frac{1}{2}$ ".

BOYAR-SCHULTZ CORPORATION

Walnut St. at Hoyne

CHICAGO 12, ILLINOIS

352—MACHINERY, September, 1946

*when you want Speed—
when you want power—*

... in your job of grinding, polishing, buffing, sanding, drilling, reaming, screw-driving or nut-setting, you want a Strand Flexible Shaft machine, because a Strand will do it faster, better, and stand up to it longer.

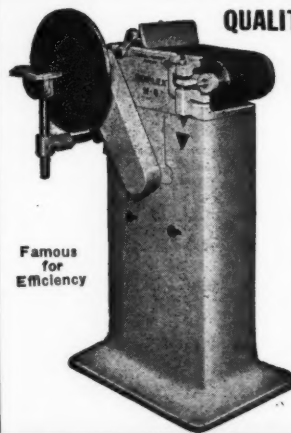
Strand Flexible Shaft machines provide constant speeds with greater operator convenience. Hundreds of attachments easily interchanged—125 types and sizes—models include vertical and horizontal type machines from $\frac{1}{8}$ to 3 h.p. Distributors in all principal cities.



Send today for catalog showing
complete line



N. A. STRAND & CO.
5011 NO. WOLCOTT AVE.
CHICAGO 40, ILL.



QUALITY • SERVICE • DEPENDABILITY

DUPLEX M-6

HIGH SPEED
BAND AND DISC GRINDER

The latest in pedestal type grinders. Actually two machines in one! 14" disc for all rough work ... 6 x 48" band for finishing. Precision-built to post war standards.

Other styles and sizes in New Booklet on Finishing. Write Today.

WALLS SALES CORP.
306 E. 38th St., New York 16, N.Y.

Consult "NEWARK GEAR"

On Your Manufacturing Problems

Gear Cutting and Machines

Gear Specialists since 1904

NEWARK GEAR CUTTING MACHINE CO.

69 Prospect St., NEWARK 5, N. J.

FRANK E. EBERHARDT, President

GET ACQUAINTED
WITH THE

Complete

VITRIFIED LINE

Send for our 65-page catalog showing types of wheels for every grinding job. BORITE—for grinding steel. CARBORITE—for cast iron, bronze, brass, aluminum. SILICATE BONDED—for surface grinding. SHELLAC BONDED—for producing high finishes, for very thin wheels. RESINOID BONDED, for high speed snagging and cutting off.

VITRIFIED WHEEL CO.

Westfield,
Mass.



ARTER

Model D 12" and 16" Rotary Surface Grinders

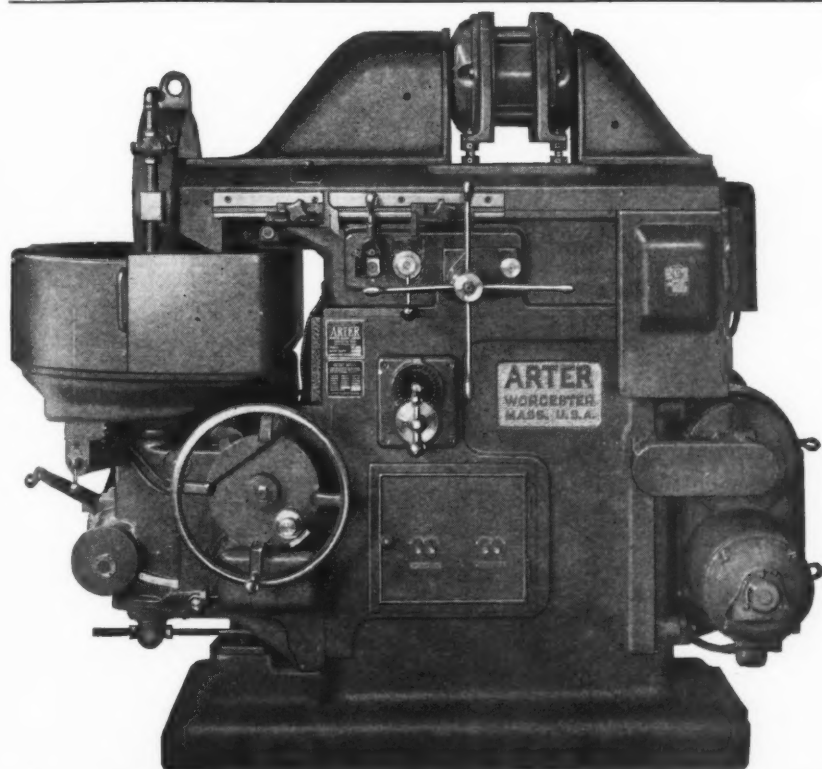
Improvements and refinements that insure work being ground to extreme precision and high finish . . . ARTER MODEL D . . . now in production.

Wheel slide hydraulically operated with piston rod and wheel spindle axis level with the longer, front extended, widened ways, gives smoothness to the traverse and stability to the spindle.

Chuck spindle mounted top and bottom in double-row, precision, preloaded ball bearings, driven by V belts from electric motor vari-speed drive unit.

Balanced motor mounted directly on the slide delivers full power to wheel spindle.

ARTER engineers are prepared to analyze your product and indicate to you how this versatile grinder can meet the most exacting requirements of your surface grinding.

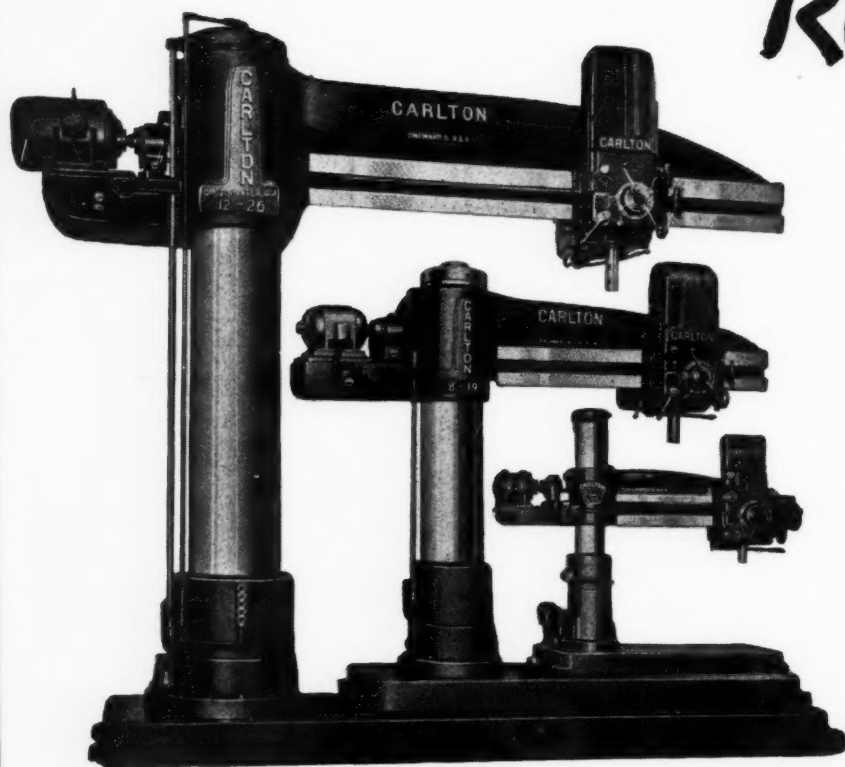


ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

CARLTON

Radials



The Carlton Machine Tool Co. offers a complete line of Radial Drilling Machines in sizes ranging from 3' arm to 12' arm, and from 9" dia. column to 26" dia. column. Carlton Radials are delivering outstanding service in almost every large manufacturing plant in the country, as well as railroad shops, shipyards, steel mills, etc. Carlton all-ball-bearing construction with original low-hung drive to spindle makes operation—even under heavy loads—smooth, vibrationless and chatter-proof. Many other modern features available. For greater production, greater economy and satisfaction . . . investigate Carlton Radials today!

THE CARLTON MACHINE TOOL CO.
CINCINNATI, OHIO

Eleven LANGELIER AUTOMATIC UNITS

**. . . BUILT INTO THIS SPECIAL MACHINE
FOR HIGH-SPEED AUTOMATIC OPERATION**

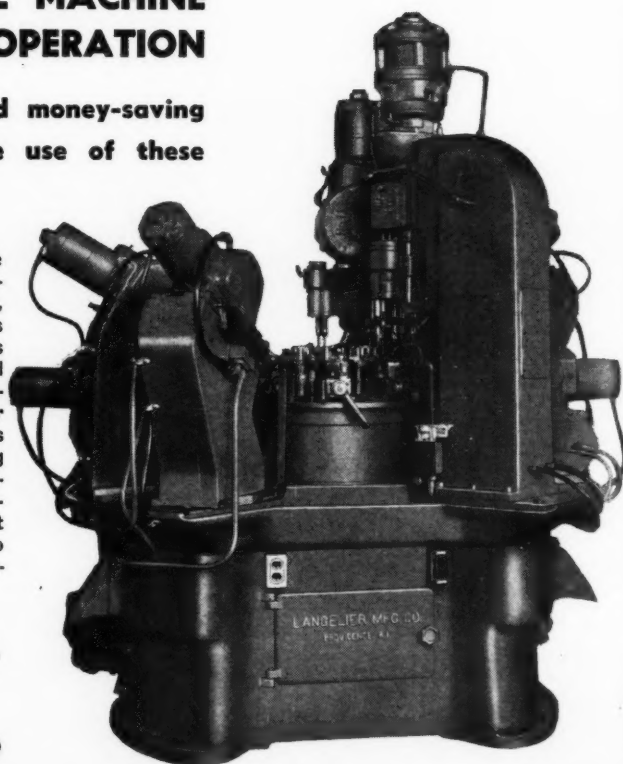
— and it's typical of the many time- and money-saving possibilities that are YOURS through the use of these versatile metal-working Units!

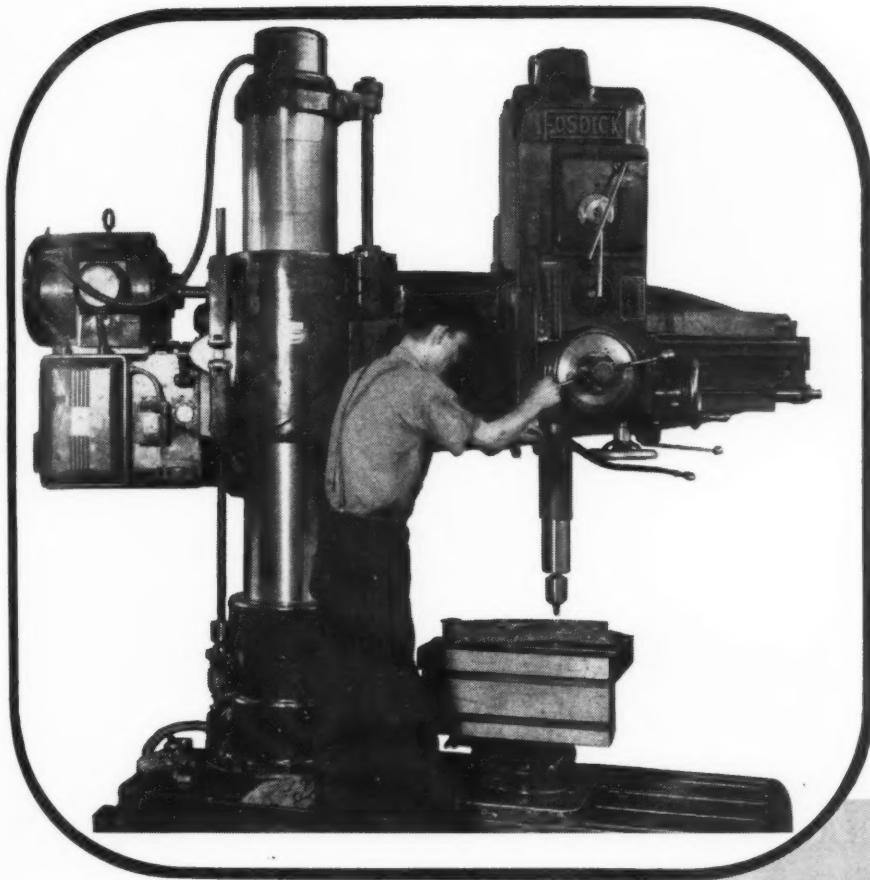
Langelier Automatic Units are ideally suited to single or multiple applications in the building of Special Machines for high production drilling, tapping, milling, counterboring, reaming, spotting, chamfering, etc. Multiple Spindle attachable Langelier Heads may be mounted on the feed sleeve of each Unit for combinations of these operations. Machine shown at RIGHT has been arranged to perform a series of drilling, counterboring and tapping operations in Carburetor Bodies. Machine features nine Langelier Drilling Units and two Tapping Units. One drilling unit is equipped with four-spindle attachable head, and one tapping unit has eight-spindle attachable head. Eight-station dial indexing mechanism is motor-driven. Entire machine electrically interlocked for fully automatic operation. Our engineering department will gladly make recommendations for machines adapted to YOUR specific requirements. (See also our Swager advertisement in this issue.)

LANGELIER MANUFACTURING CO.

Drilling and Swaging Specialists for
Over 50 Years . . . Incorporated 1887

PROVIDENCE • RHODE ISLAND





● In machine tool plants—in production shops—in contract work plants—wherever there are numerous drilling—reaming—tapping and boring operations requiring radial drills you will find Fosdick Hydraulic Radials.

On the job shown a Fosdick Radial is drilling and reaming three 1-1/4" holes and one 1-3/8" hole in a steel casting which will eventually be assembled into an automatic screw machine.

The wide range of feeds and speeds—all controls conveniently located on the head—the full hydraulic circuit for manipulating controls are features that make for ease of operation and versatility.

No matter what your drilling—reaming—facing—tapping or boring operation may be, if it can be done on a Radial you can do it easier, better and at less cost on a Fosdick Hydraulic Radial.

For full details of construction and operation ask for Fosdick Radial Bulletin M. R.

FOSDICK *Hydraulic* **RADIAL**

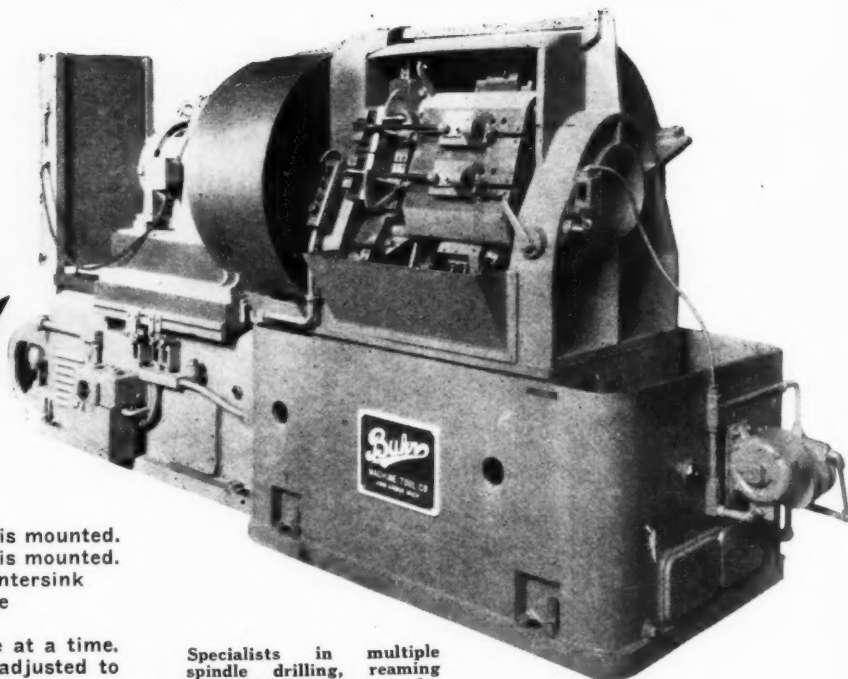
*drills and
reams parts
for*

Automatic Screw Machines

FOSDICK

MACHINE TOOL COMPANY
CINCINNATI 23 . . . OHIO

18 Different Parts DRILLED With This MACHINE !!



A Hydraulic unit on which an 8-spindle head is mounted.
A base on which a 5-station trunnion fixture is mounted.

Station No. 1—Load Station No. 3—Countersink
Station No. 2—Drill Station No. 4—Face
Station No. 5—Ream

Two steering tie rods are clamped in fixture at a time.
Clamping arrangement is so that it can be adjusted to
take care of eighteen (18) different tie rods.

Safety device prevents machine from being started until
trunnion index plunger is in place.

Specialists in multiple
spindle drilling, reaming
and tapping equipment for
all industries.

Send blue prints of parts. We'll help
solve your production problems.

All gears shaved and
induction hardened.

BUHR MACHINE TOOL CO.

843 GREEN STREET
ANN ARBOR, MICHIGAN

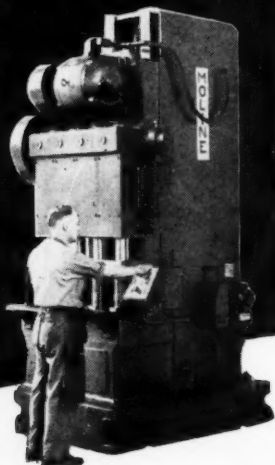


**For Man-Hour Savings—
For Better, Smoother Work—
USE A "HOLE-HOG"**

- Boring—rough, semi-finish and finish • Honing
- Milling (special machines) • Straight Line Drillers
- Universal Adjustable Spindle Drillers • Way Type
Machines—horizontal and vertical drilling, tapping
and boring machines.

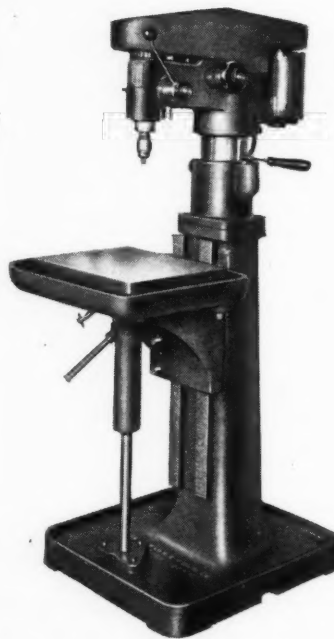
Since 1901, Moline machine tools have been
producing better work,
continuously, at greater
production and man-hour
savings. They are rug-
gedly built and engi-
neered to fit your par-
ticular needs, but are
easy to change over to
other jobs.

Write us for informa-
tion concerning machine
tool equipment for your
special problems.



MOLINE TOOL COMPANY
107 20th Street Moline, Illinois

The Drill with a Hundred and One Speeds



**All Speeds In-
stantly Available
While Machine
Is Running**

M-125— $\frac{3}{8}$ Cap.
M-96— $\frac{7}{8}$ Cap.
1 to 6 Spindles

Correct speed at the
turn of a knob.

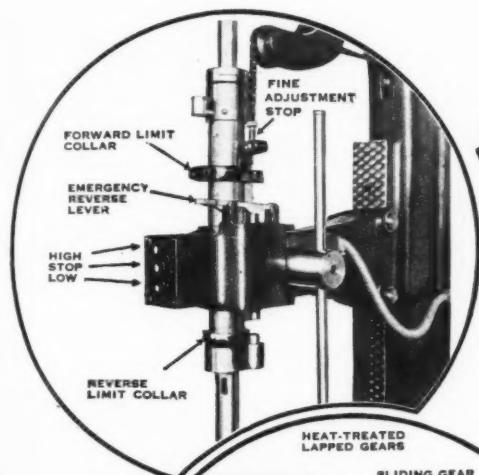
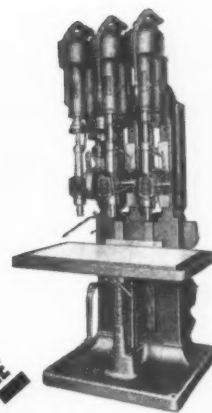
Speed Chart on front
of head.

Ability to obtain exact
speed for diameter of
drill and material to
be used results in less
breakage, fewer grinds
and higher efficiency.

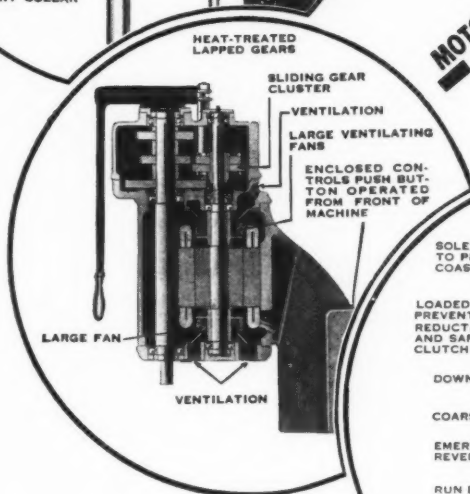
Write for Circulars.
MM-125 MM-96

THE TAYLOR & FENN CO., Hartford, Conn.

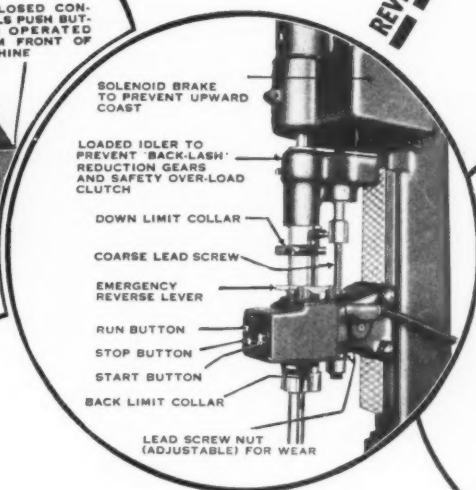
Avey FEATURES mean A BETTER DRILLING MACHINE



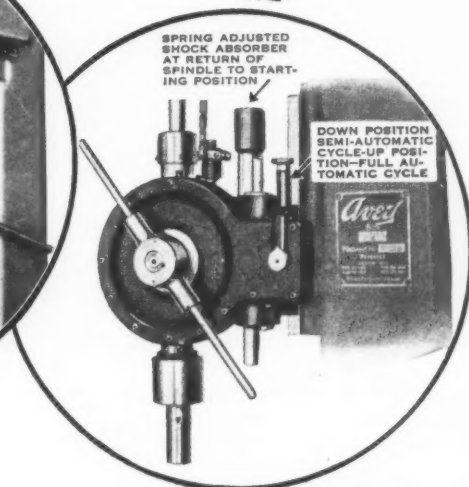
HAND FEED REVERSING MOTOR FOR TAPPING



MOTOR & GEAR BOX CONSTRUCTION OF 6 SPEED MACHINE



REVERSING MOTOR—POSITIVE LEAD SCREW TAPPING



SINGLE LEVER CONTROL—AVEYMATIC POWER FEED

The Avey Type MA-6 is made in the following capacities

- No. 2— $\frac{7}{8}$ " capacity in cast iron
- No. 3— $1\frac{1}{4}$ " capacity in cast iron

Any spindle of MA-6 can be arranged with any one of above FEATURES giving ease of operation—ideal for production set up.



GRAND RAPIDS STYLE 10-B COMBINATION TAP AND DRILL GRINDER



Longer life for your drills and taps! More accurate holes with less frequent regrinding! Here's the story of the Style 10-B Tap and Drill Grinder:

SHARPENS DRILLS sizes $\frac{1}{8}$ to $1\frac{1}{2}$ inches, 2- and 3-flute, straight or taper shank. Automatically grinds proper length of cutting lip, correct and equal angles of lips, correct clearance angle.

SHARPENS TAPS sizes No. 6 to $1\frac{1}{2}$ inches, 2-, 3- and 4-flute, right or left hand. Taps require less regrinding, cut with about half the usual power, stay sharp over twice as long.

SEND FOR CATALOG

GALLMEYER & LIVINGSTON CO.
305 STRAIGHT AVE., S.W.
GRAND RAPIDS 4, MICHIGAN
Manufacturers of Precision Grinding Machines

DAVIS KEYSEATERS

QUICKER Set-up!
QUICKER Cutting!

Davis tilting table with direct-reading scale makes setting up a matter of minutes. Straight work or tapers as much as 3" per foot can be set up; bores as long as 14" can be cut. Thin pieces with short bores can be stacked and several cut at once. Cutters for these machines

are made in our own plant and carried in stock for quick shipment. Use Davis

Keyseaters for job work or long-run production. Equally fast. Equally economical.

Send for bulletin.



**DAVIS
KEYSEATER
COMPANY**
405 EXCHANGE ST.
ROCHESTER 8, N. Y.

SAWS for ALL METALS



Huther Bros. make the saw for your work—for brass, copper, aluminum, steel. Correct pitch, correct tooth form, correct steels—all contribute to maximum speed and efficiency. Write for our catalog of saws for every metal cutting need.

Huther Bros. Saw Mfg. Co.
ROCHESTER NEW YORK

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine

THE LUCAS MACHINE TOOL CO.

CLEVELAND, OHIO, U. S. A.

NOW AND
ALWAYS OF

JONES MACHINE TOOL WORKS, Inc.

Manufacturers of

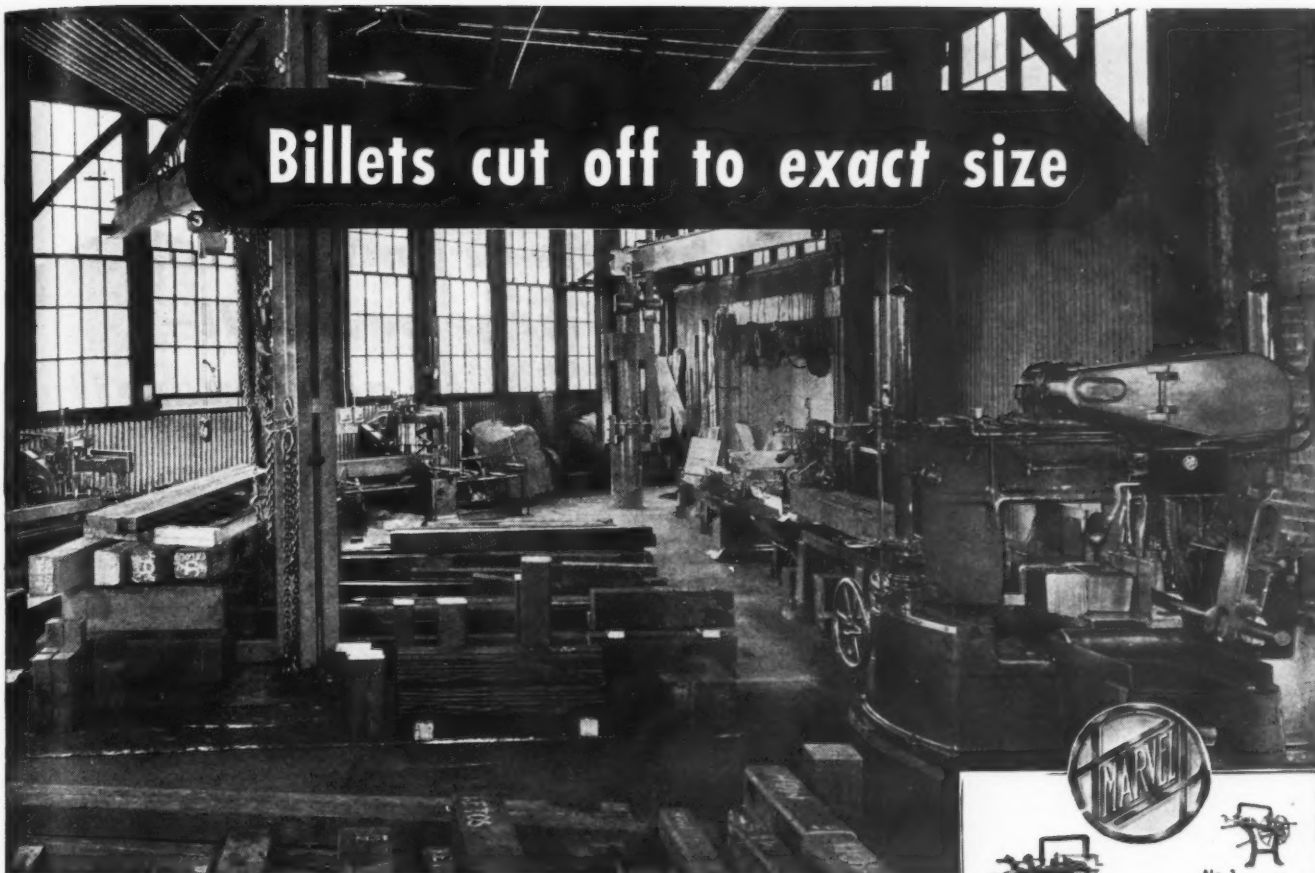
VERTICAL SHAPERS • SLOTTERS • STRAIGHT EDGES
VERTICAL BORING MILLS

HORIZONTAL BORING MILLS

SURFACE PLATES AND SPECIAL MACHINERY

King of Prussia, vicinity of VALLEY FORGE, PA.

Billets cut off to exact size



Any Quantity cut-off automatically

These MARVEL Saws are money makers for this modern forge shop in many ways. (1st) they cut off billets for a small fraction of the cost of cutting-off with a hammer. (2nd) these billets are so accurate in size that they exactly fill the dies with no excess fin, not only simplifying trimming and finishing, but getting extra billets from many bars. (3rd) they keep all hammers busy on *production* work for these "world's fastest" saws can keep ahead of any schedule. (4th) they reduce cutting-off labor costs to an absolute minimum. It takes only one operator and a helper to keep all of these saws running because all but the No. 18 Giant Hydraulic Saw (at the right) are *automatic*—feed measure, and cut-off identical billets; requiring no more attention than automatic screw machines.

Your local MARVEL Sawing Engineer will gladly call and explain how you can add these five extra profits to your forge operation.

ARMSTRONG-BLUM MFG. CO.

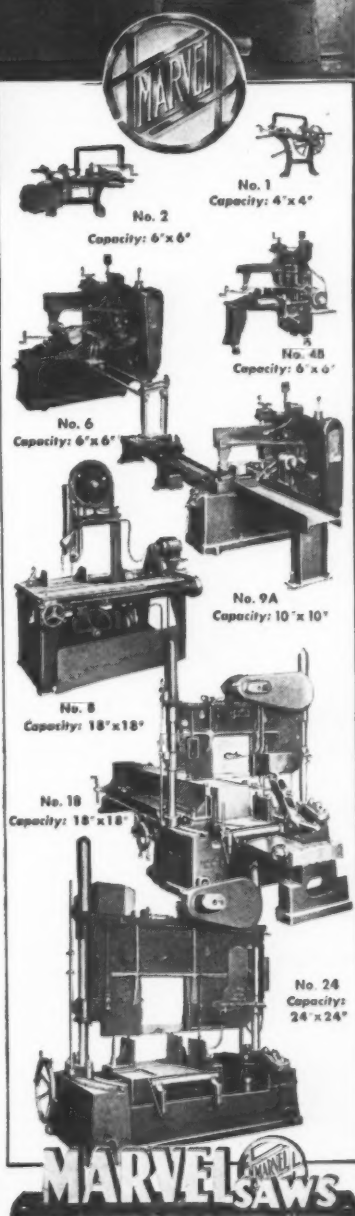
"The Hack Saw People"

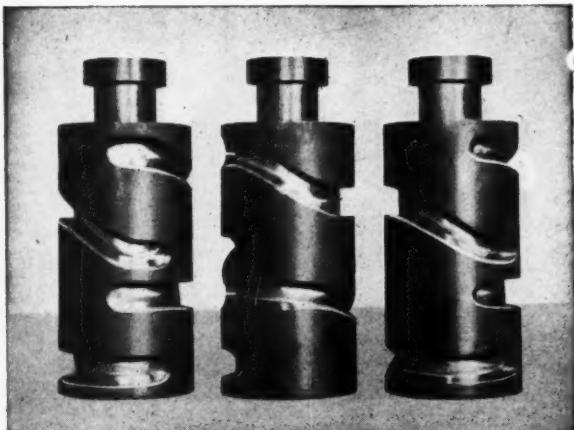
5700 BLOOMINGDALE AVENUE

CHICAGO 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS





CAMS!

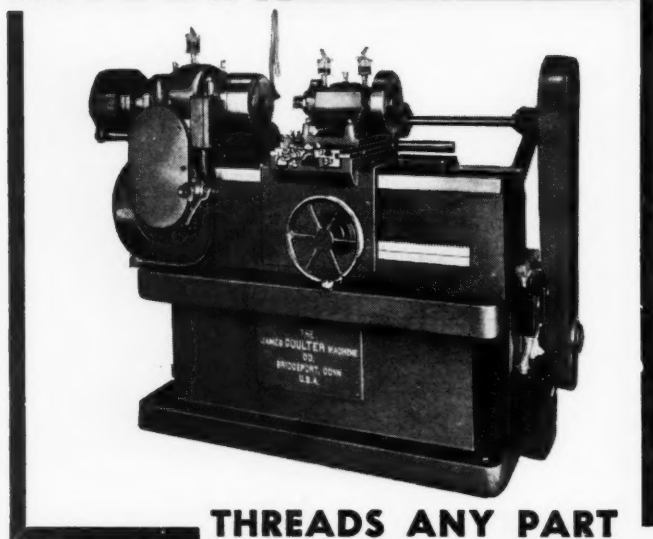
*Simple or Intricate—
Large or Small—
in any Quantity*

Our facilities are devoted entirely to cam design and cam making. Our equipment enables us to produce cams of any size or type . . . in any quantity. Our experience has helped thousands of engineers and production men to solve their problems of cam application, cam design and cam manufacture. Give us the job of producing your cams and save valuable production time by releasing skilled mechanics and valuable machines for other work.

THE ROWBOTTOM MACHINE CO., WATERBURY, CONN., U. S. A.

Rowbottom for Cams

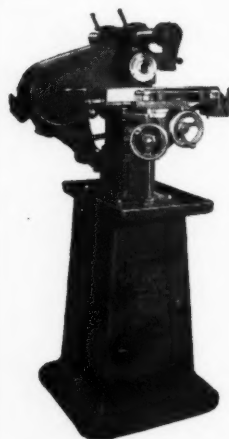
COULTER HOB THREAD MILLER



THREADS ANY PART THAT CAN BE CHUCKED

Large or small, long or short, internal or external jobs can be threaded quickly and accurately with the Coulter Thread Miller. Work and cutter spindle are driven by individual motors, providing a wide range of feeds and speeds. Write for further details of the infinite possibilities of this versatile machine.

THE JAMES COULTER MACHINE CO.
BRIDGEPORT 5 CONNECTICUT



BURKE MILLING MACHINES and ATTACHMENTS

Designed especially for the profitable handling of small and difficult work on a production basis. Burke Milling Machines are available in sizes Nos. 1, 2, 3, and 4, all motor driven.

Illustrated No. 4 Motor Driven Machine mounted on cabinet column. Write for complete details.

Burke Machine Tool Co.
297 E. 16th ST., CONNEAUT, OHIO

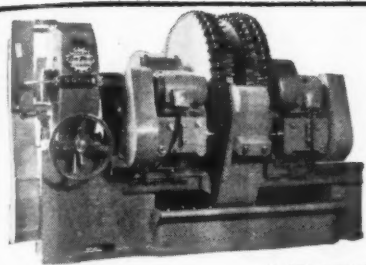
FACE WHILE BORING

M-D Facing Head can be attached to Column Boring Mill Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically. 10 sizes, 6" to 46" dia. Write for descriptive bulletin and prices.

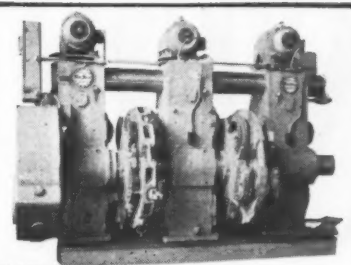
MUMMERT-DIXON COMPANY
HANOVER, PA.

La Salle Engineering Co.

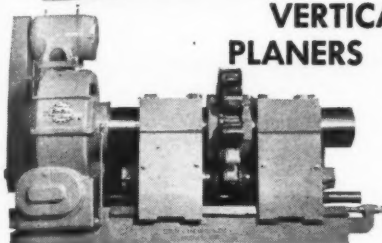
TOOLS, PRODUCTS, SPECIAL MACHINES; DESIGN & BUILD
CHICAGO • LOS ANGELES • NEW YORK



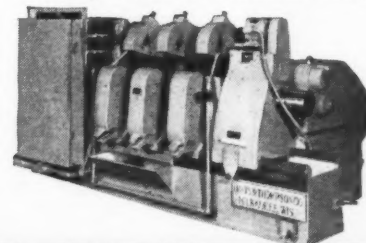
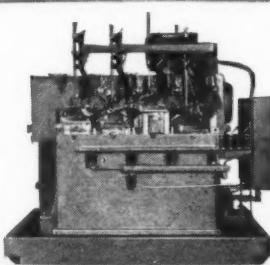
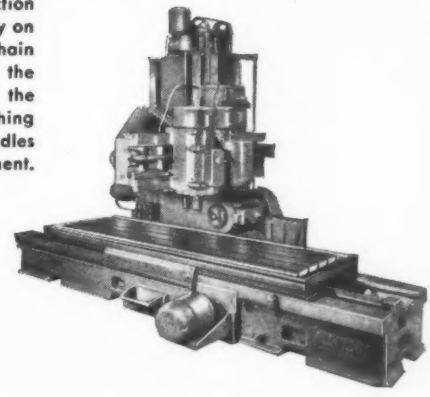
Roto-Matic MILLERS



ROTARY DRUM TYPES • VERTICALS • SINGLE AND MULTIPLE SPINDLES PLANERS • RISE AND FALL • VERTICAL INDEXING



The ROTO-MATIC principle of continuous production insures the maximum of production and accuracy on any job to which a Miller has been adapted. Chain clamping mechanisms, where adapted, leave the operator free to load and unload parts. On the larger type Rotary Drum Type Millers finishing spindles are adjustable for toe cut. All spindles have provisions for micrometric endwise adjustment.



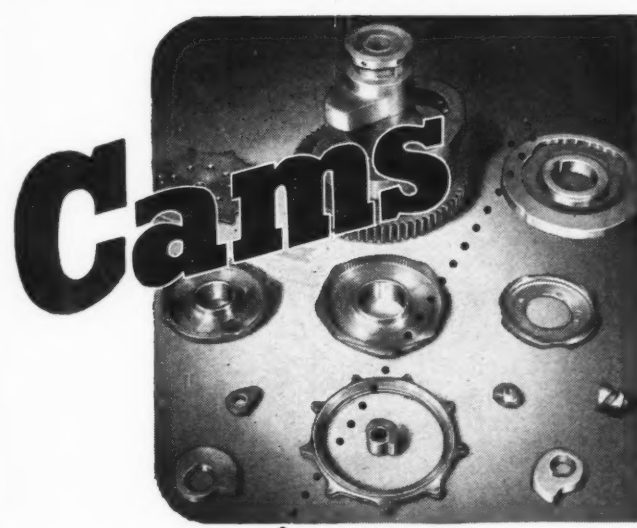
MILLING • DRILLING • REAMING • BORING • PIPE THREADING • SPECIAL MACHINES

DAVIS & THOMPSON COMPANY

MANUFACTURERS: MACHINE TOOLS, MICROMETERS AND GAGES

MILWAUKEE

WISCONSIN



Cams

• 25 YEARS of experience in making special cams for thousands of companies has made us experts at cam cutting and grinding. Our facilities and equipment, the most complete of any plant in the country, permits us to manufacture any style or size of Cam, Geneva Motion, or Scroll Plate in quantities of 1, 10 or 10,000. Accuracy can be held to split thousandths, and surfaces to micro-finishes. Send us specifications or blueprints and we will be glad to submit a detailed quotation to you on your requirements.

KUX MACHINE COMPANY

3925 WEST HARRISON STREET • CHICAGO 24, ILLINOIS

BIG PRODUCER! THE



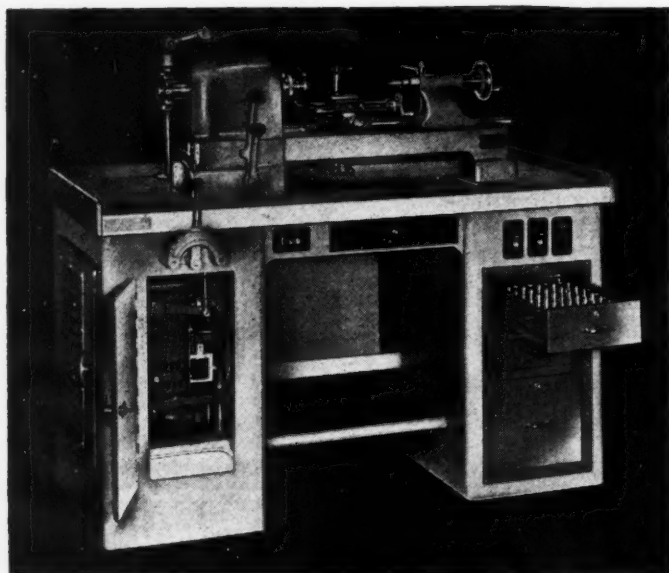
HAND MILLER

Big in production ability, ruggedly built, with ample weight for heavy cuts. Table size, 16 3/4" x 5 3/4". Speed range from 600 to 1200 R.P.M. with direct drive through self-tensioning V-belts. Accurately ground. Timken-equipped spindle. Write for details of how Frew gives you "big machine" efficiency on small jobs.



THE FREW MACHINE CO. 121 E. LURAY ST. PHILADELPHIA 20, PA.

STEP UP PRODUCTION

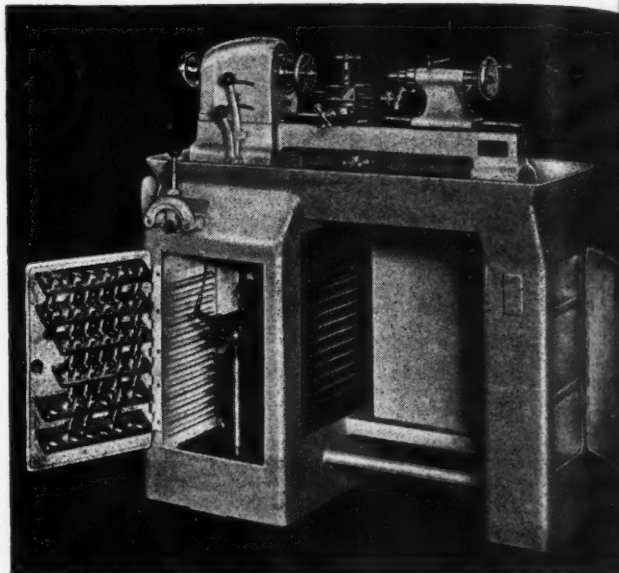


(Upper) Elgin Desk Type Bench Lathe

Variable Speed Drive, 40 to 4000 RPM. Low speed rate for grinding operations. Free turning spindle for truing-up and setting work by hand. Ample drawer space. 9" swing, 17" between centers, 1" collet.

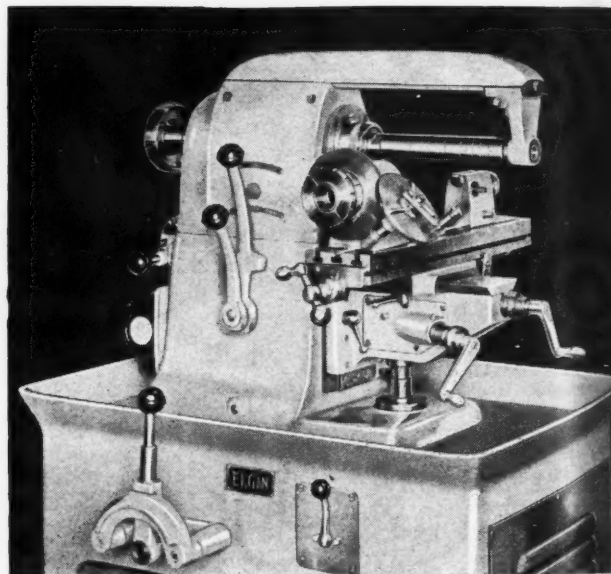
(Lower) Elgin Open Bench Lathe

Laminated hard maple top, enclosed motor, safety guard for belt, handy collet drawer. Variable Speed Drive for any spindle speed from 120 to 3800 RPM. 9" swing, 17" between centers, 1" collet.



(Upper) Elgin Knee Hole Type Bench Lathe

Has Variable Speed Drive with range from 120 to 3800 RPM. 9" swing, 17" between centers, 1" collet. Generous leg room for operator. Door of motor cabinet fitted with collet rack. Three roomy storage shelves.



(Lower) Elgin Horizontal Bench Milling Machine

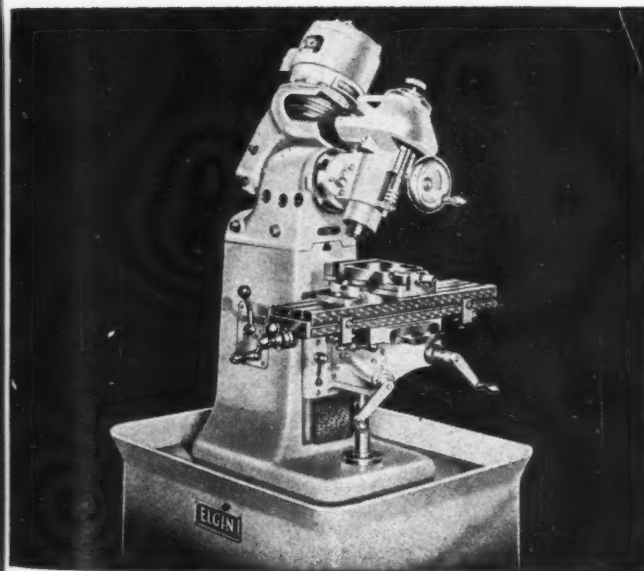
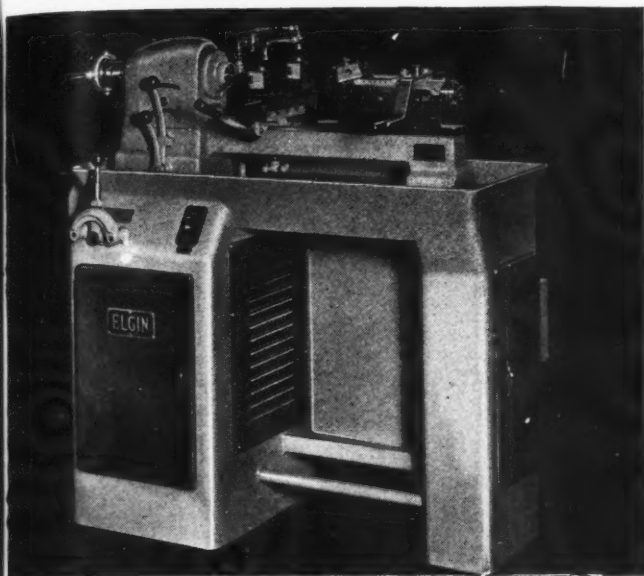
Equipped with Variable Speed Drive for spindle speeds from 85 to 2750 RPM. Collet capacity, 1". Table $4\frac{1}{8}$ " x 18". Longitudinal travel, 12". Transverse travel, 6". Vertical travel, 6".

ELGIN TOOL WORKS.

DUCTION WITH ELGINS

Lathes • Screw Machines • Millers

★ The entire line of ELGIN High Speed Precision Bench Tools is designed to pay you dividends in faster production, better machining results, greater versatility, maximum operator convenience. The machines shown here assure "complete coverage" of your needs for both toolroom and production work. Note the trim, clean-cut lines . . . the provisions for operator comfort . . . the ample storage space for tools and accessories. And remember—the Elgin Bench Tools shown in the large illustrations (with exception of Vertical Miller) are equipped with the VARIABLE SPEED DRIVE which permits instant changes of spindle speeds over a wide range of RPM without stopping spindle and shifting belt. Operator is encouraged to use proper speed for each operation, changing as often as necessary . . . which means no delays, closer precision, better finishes. Write for specifications, prices, delivery dates!



(Upper) Elgin Knee Hole Type Hand Screw Machine. Variable Speed range, 120 to 3800 RPM. 9" swing, 1" collet capacity. Collet rack inside of motor compartment door. Independent coolant system (5 gal.) mounted in rear, outside—cleaner, more accessible.

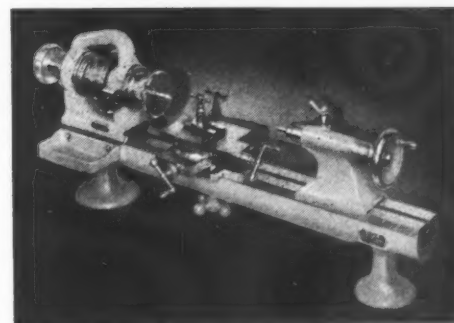
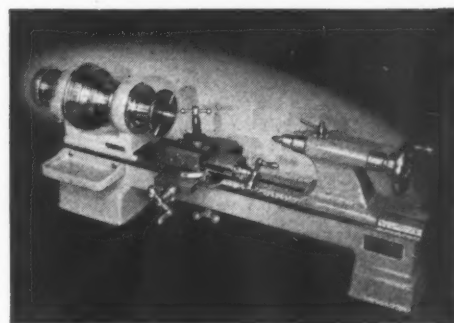
(Lower) Elgin Vertical Bench Milling Machine. Preloaded ball bearing spindle. 9/16" collet capacity. Five speeds ranging from 400 to 4000 RPM. Vertical travel of spindle, 1 3/4". Table 4 1/8" x 18". 90° swivel each side of center line.

RIGHT: MODEL CB-5C PRECISION BENCH LATHE

Open Cone Headstock. 1" collet capacity, 9" swing, 17" between centers, 36" bed. Speeds up to 4000 RPM. Flat belt only.

MODEL 4EV PRECISION BENCH LATHE

Open Cone V-belt Headstock. For either V or flat belt operation. 7/16" collet capacity, 7" swing, 17" between centers, 32" bed. Speeds up to 10,000 RPM.

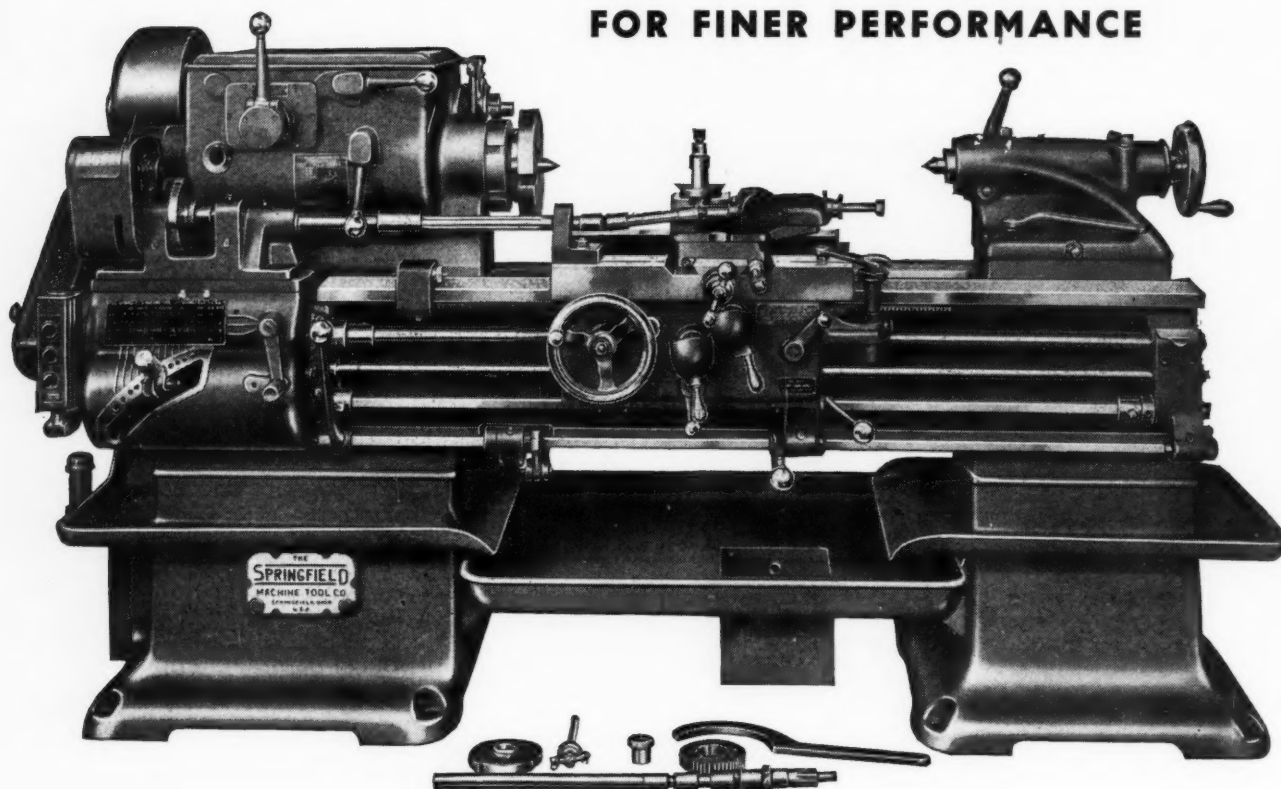


1770 BERTEAU AVE., CHICAGO 13, ILL., U. S. A.

MACHINERY, September, 1946—363

SPRINGFIELD TOOL ROOM LATHES

EVERY DETAIL DESIGNED
FOR FINER PERFORMANCE



Judge the performance of a Springfield Lathe by your most exacting standards. You'll find accuracy combined with ruggedness . . . high capacity with ease of operation . . . power with economy. These qualities—each of them in its highest degree — are combined in the design of the Springfield Lathe. From headstock to tailstock, every detail is built to assure finer performance. Material and design have been integrated throughout to give maximum rigidity, greatest wear resistance and lasting precision. Meet the needs of peacetime production with lathes that are long-term investments in economical precision. Built in sizes from 14" to 30", they are described in full in our Bulletins. Write for details.

TAILSTOCK:



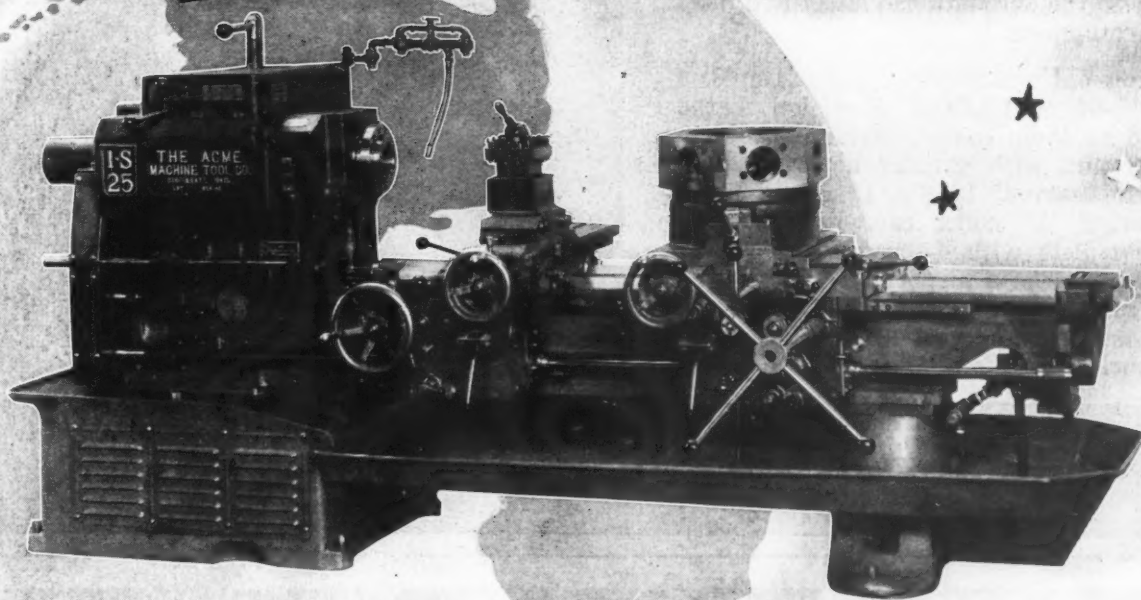
Large centers, heavy design throughout, with exceptionally long spindle travel are features of Springfield tailstock design. Spindle is not used as a nut for the screw, so that replacement of spindle is unnecessary when screw becomes worn. A brass nut inserted in the rear of the spindle is all that needs to be replaced. Double set-over screws, non-split bands and heavy, double clamping bushes all give long continuous service.

SEND TODAY FOR
BULLETIN NO. 162

THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD, OHIO

FAMOUS THE WORLD OVER THE ACME TURRET LATHE



The Acme Turret Lathe is the machine with a future. In the production of today and tomorrow Acme takes a high place. Power—Speed—Rigidity—Accuracy—Durability—5 keynotes of the Acme Turret Lathe that insures top production for years to come.

★ BUILT TO LAST
★ DESIGNED FOR THE FUTURE

WRITE US FOR
COMPLETE INFORMATION

THE ACME MACHINE TOOL CO.
CINCINNATI 32, OHIO

Gentlemen: Please send me without obligation
Engineering data, bulletin, etc.

NAME _____

COMPANY _____

ADDRESS _____

The ACME MACHINE TOOL Co.
CINCINNATI 32, OHIO

How many Wars have your lathes fought?

Wars demand the utmost from machines, yet if yours is the average shop or plant, many of your lathes are "veterans" of two or more wracking periods of speed-up, round-the-clock war production. On any logical basis, these tools are ready for replacement, for in battles, whether national or commercial, success goes to the one with the latest and most efficient equipment.

In turning out small parts, for example, a modern S-56 SHELDON Precision Lathe will produce them easier, faster, more economically and with greater accuracy than any "battle scarred" 1898 or 1918 tool. These 11 $\frac{1}{4}$ " swing, 1" collet capacity, 56" bed lathes, complete with 4-speed V-belt motor drive, mounted on a modern, 5-drawer steel bench, are so moderate in price that you can have several for the cost of one large tool room lathe. *Write for Catalog.*



SHELDON S-56 10" Precision Lathe—
11 $\frac{1}{4}$ " Swing, 1" Collet Capacity.

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Arbor Presses • Vises
Sheldon-Vernon Horizontal Milling Machines • Vertical Milling Machines and jig Boreers • Shapers
4246 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

MOREY *Universal* TURRET LATHES for BAR or CHUCKING

THE TURRET LATHE *Your Operator*
APPROVES!

EASY TO OPERATE • ACCURATE
DEPENDABLE • RIGID AND
POWERFUL ENOUGH TO FULLY
UTILIZE PRESENT-DAY HIGHSPEED
CARBIDE TOOLS

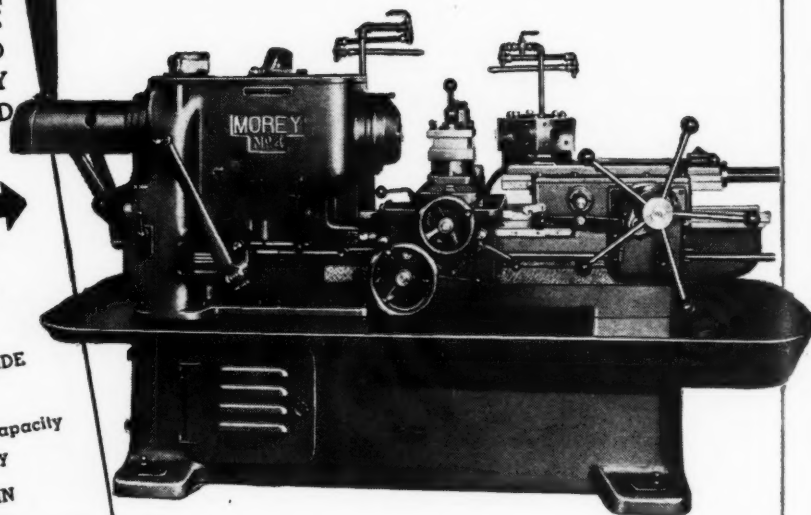
#4 UNIVERSAL →

For bar stock up to 2" in diameter
12" turning length 19 $\frac{1}{2}$ " swing over bed
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor, 1200 RPM
MAY BE HAD WITH PLAIN CROSS SLIDE

Also available in

No. 3 Universal, 1 $\frac{1}{2}$ " capacity
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ASK FOR DESCRIPTIVE BULLETIN



STOCK DELIVERY

DESIGNED AND BUILT BY

MOREY MACHINERY CO., INC

410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

The Wade No. 8-A Toolmaker's Lathe Guarantees highest returns on your investment...*because*

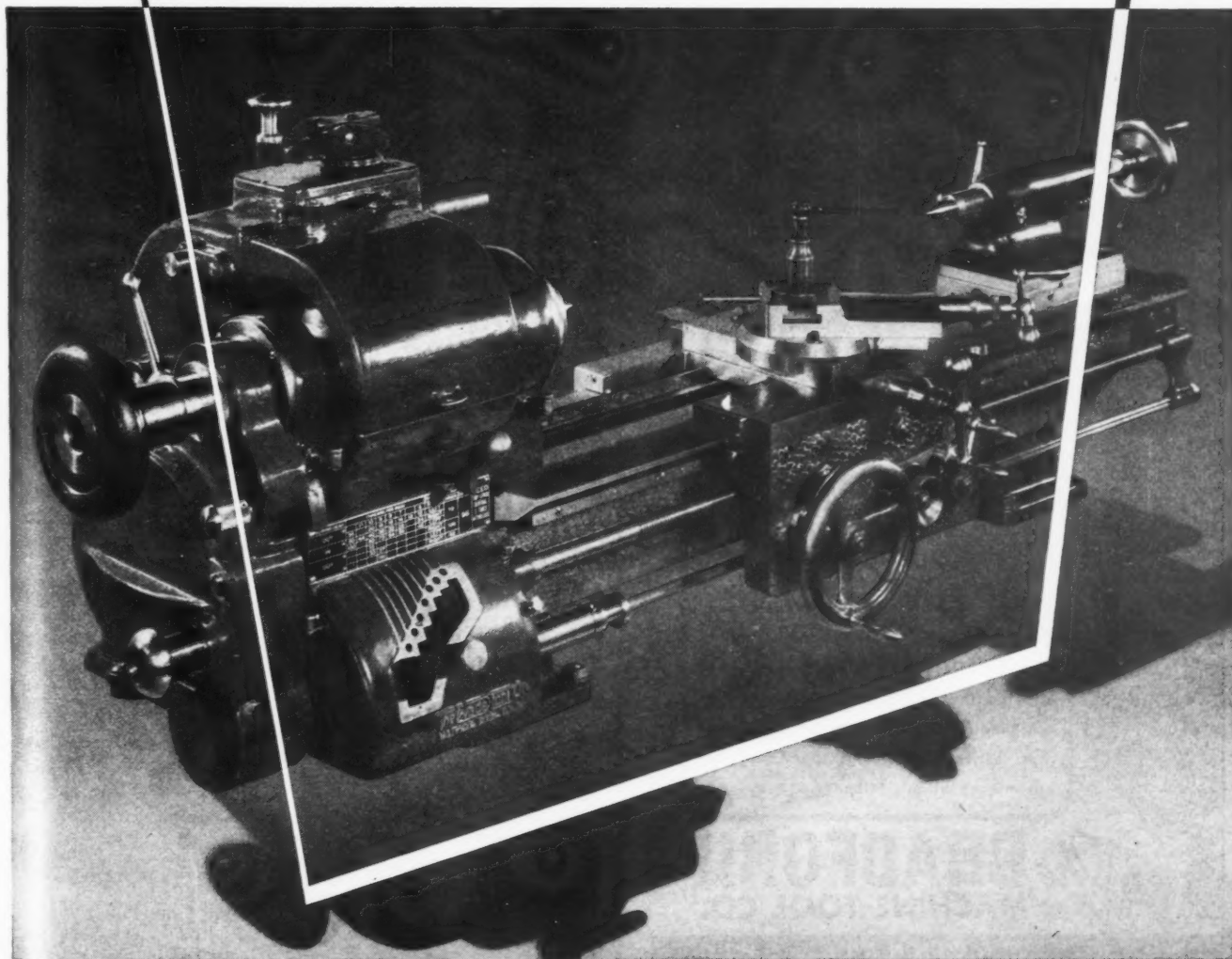
We guarantee that the Wade No. 8-A Toolmaker's Lathe will out-produce and out-perform any make of lathe within its size and capacity!

We back up this guarantee with such 8-A features as instant reversing—
instant Hi-Lo speeds (3:1 ratio)—vibrationless operation—highest speeds—
enduring accuracy—finest finish—most advanced spindle bearing design—a
complete line of tools and accessories for utmost versatility. For the com-
plete story and detailed specifications, write for catalog.

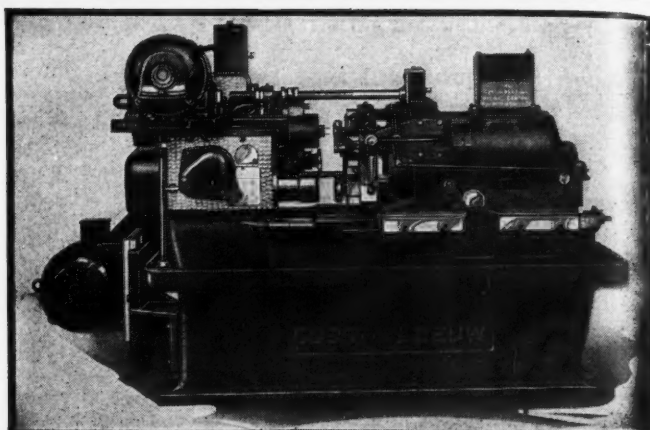
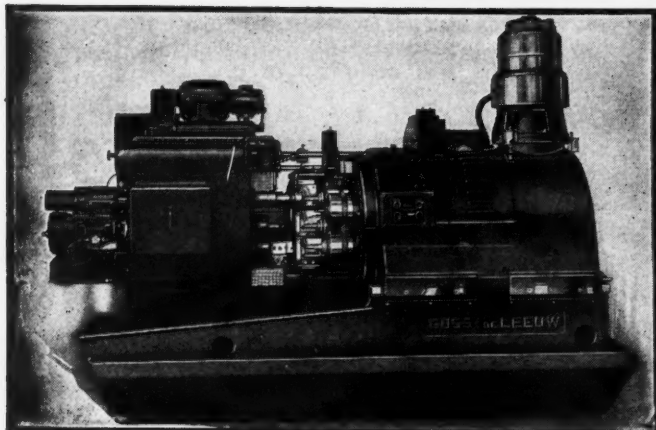
Wade

The Wade Tool Co.

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GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES



**WORK
ROTATING
TYPE**

5 Spindles
6 Spindles
8 Spindles

Features include:

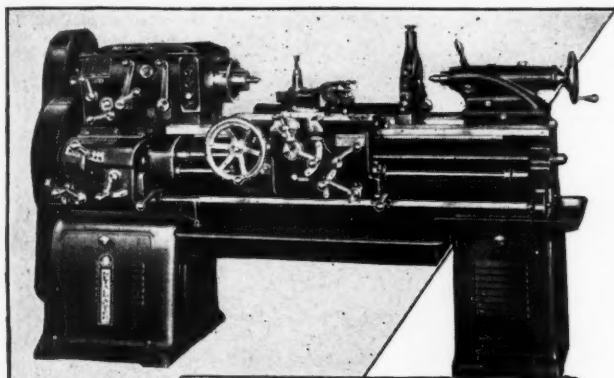
Lead Screw Threading on both types—Pre-loaded Anti-friction Spindle Bearings—Hardened Ways—Oversized Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

**TOOL
ROTATING
TYPE**

4 Spindles
5 Chucking
Positions

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BRADFORD METALMASTER *does it faster*

Compare BRADFORD'S performance. You'll discover that for speed, accuracy BRADFORD ranks—first. Precision constructed the BRADFORD Metalmaster is designed for your wartime and peacetime jobs. Write for catalogs describing the advantages of this lathe.



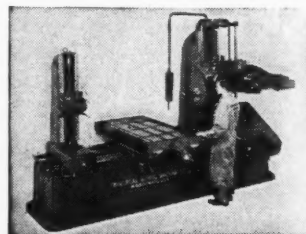
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UNIVERSAL Horizontal Boring Machine The only **TRIWAY** Boring Machine Built

Made in 3", 4" and 5" spindle sizes. Write for complete, detailed specifications. Represented throughout South America by Machine Affiliates.



Standard Universal 3" Spindle Machine

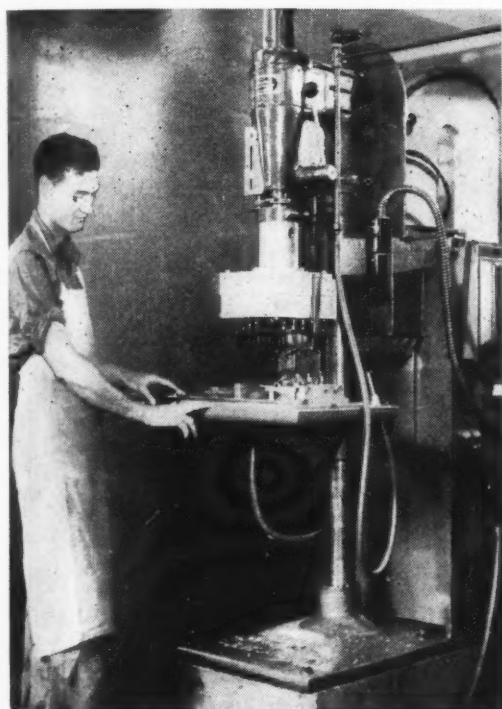
UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.





30 seconds

TAPPING TIME: 3 MINUTES



Johnson Motors, of Waukegan, Ill., formerly tapped stud holes in the aluminum blocks of its famous two-cylinder outboard motors one at a time. The job involved tapping 7 No. 10 24-thread holes to a depth of $\frac{7}{16}$ " and 6 $\frac{1}{4}$ " 20-thread holes to a depth of $\frac{9}{16}$ " and required 3 minutes.

Today, using a special head designed by Cleveland engineers, all holes are tapped in two passes on one of Johnson's twelve Cleveland Lead Screw Tapping Machines. Tapping time is reduced to 30 seconds.

Rejects, the Johnson foreman reports, have not increased despite the increased tapping speed. On the other hand, better sizing is obtained and greater accuracy is maintained through stop-start con-

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And, according to the foreman, the Cleveland gives absolutely accurate depth control while the enclosed coolant system, under the operator's control, greatly reduces tap wear.

This report is typical of hundreds of cases in which Cleveland Lead Screw Tapping Machines are helping to cut tapping costs.

If you have a tapping job . . . involving one hole or a score . . . Cleveland engineers can show you how to do it faster, better and at an important saving. Just write. The Cleveland Tapping Machine Company, 3610 Superior Ave., Cleveland 14, Ohio.

CLEVELAND

Lead screw
tapping machine

just off the press

A new, greatly enlarged edition of the popular "Production Tapping Guide" — 20 pages of valuable data for the estimator, set-up man and operator.

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YOUR FREE COPY**



The
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Mr. _____

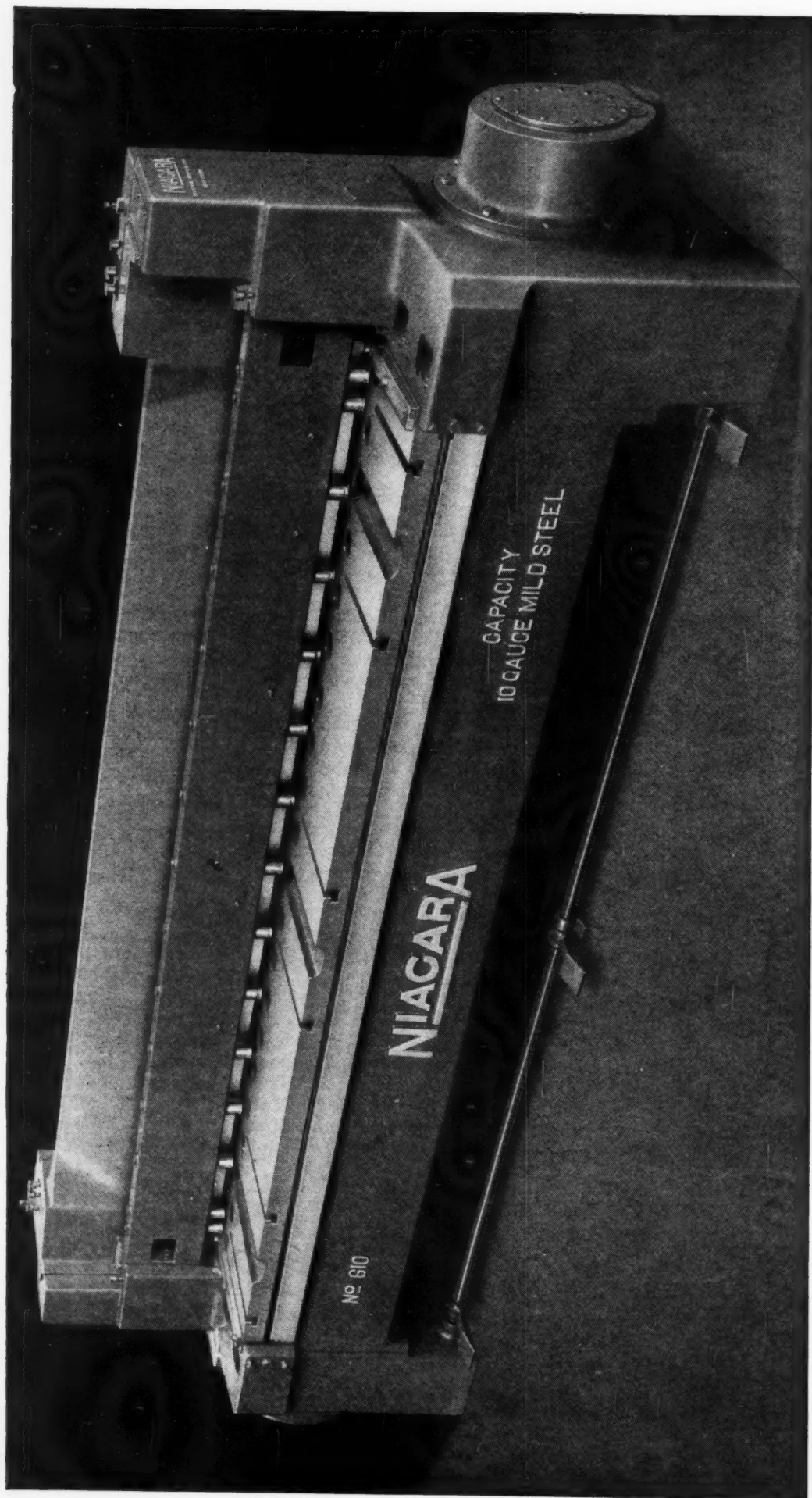
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MACHINERY, September, 1946—369

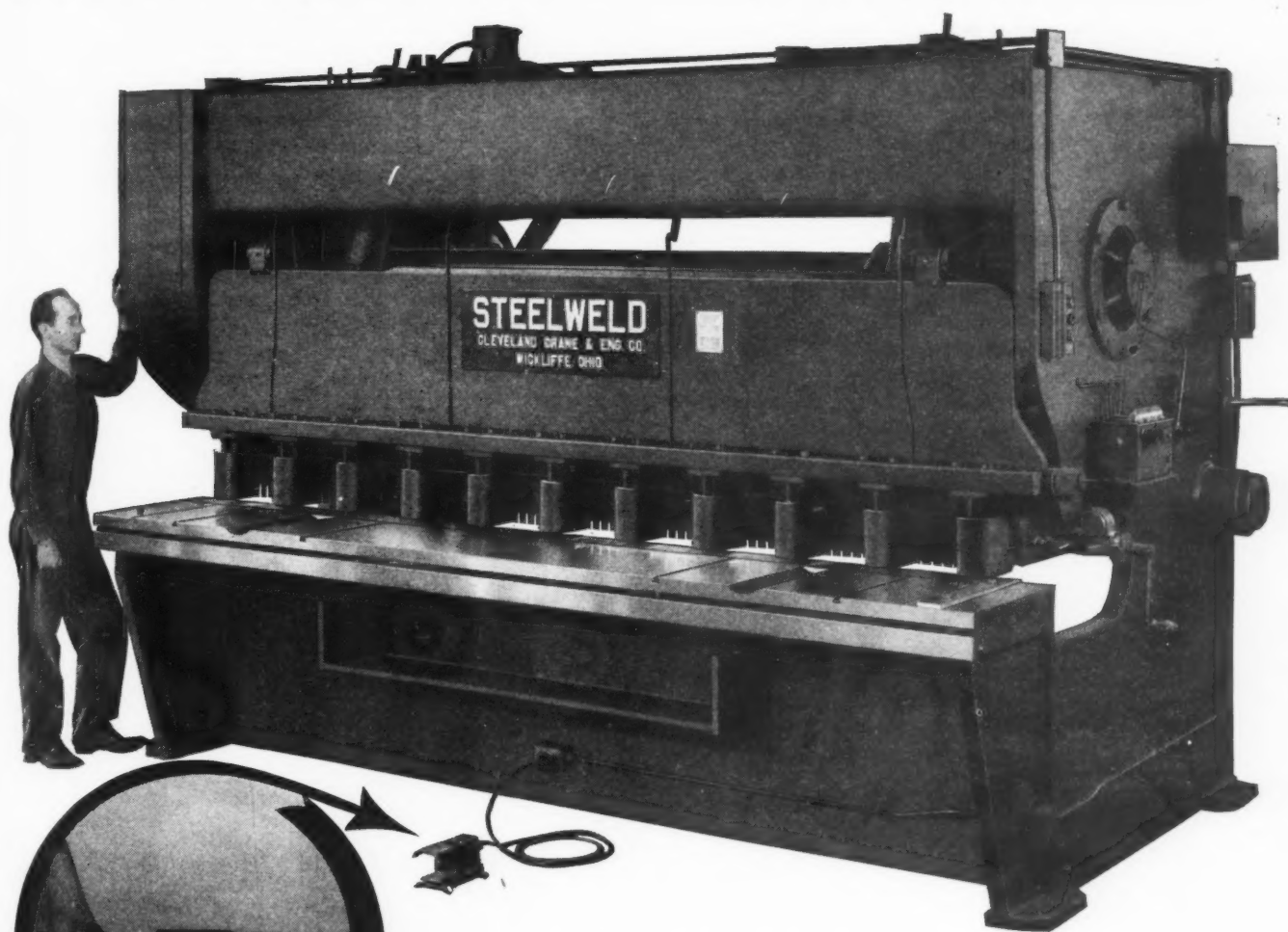


Plants are obtaining more production per man-hour with Niagara Power Squaring Shears because of accurate cutting, quick setting, ball-bearing, self-measuring parallel back gages, full visibility of cutting line, instant acting Niagara sleeve clutch and other modern features.

Enclosed drive with gears, clutch and eccentrics running in oil assure long life and low maintenance cost. Four-edge, solid tool steel knives are standard equipment. Niagara Machine & Tool Works, Buffalo, N. Y. District Offices: Detroit, Cleveland, New York.

Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory regrinding service by the same skilled men who grind new Niagara knives.

FOR A *New Thrill* IN SHEARING . . .



Series No. 410 Shear for cutting steel plate up to $\frac{3}{8}$ " x 10'-0"

The electric foot switch is one of the many features that makes operation of Steelweld Shears easier and faster. It can be slid around the floor to wherever most convenient. Only a slight movement of the toe is required to operate it. This feature is standard on all Steelweld Shears, and is furnished at no extra cost.

TRY STEELWELD *Pivoted-Blade* SHEARS

REGARDLESS of what shears you have ever operated, in Steelweld Pivoted-Blade Shears a new thrill is in store for you.

Like a modern streamlined engine as compared to an old-time locomotive, or a luxury liner versus a tramp freighter, so will you find these new shears as compared to all power shears you have ever used before.

Here at last is something new in shearing history — a great advancement in design and performance

— the only truly basic change for many decades.

Not only are these new shears easier to operate but their design assures smooth straight cuts to hair-line accuracy for years of operation. Their construction is extra heavy and all modern features are incorporated to provide for ease of operation, minimum maintenance and long life.

If you shear plate in any thickness to $1\frac{1}{4}$ -inch or length to 18 feet, you should get the facts on these new Steelweld Shears. Send for catalog today.



GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

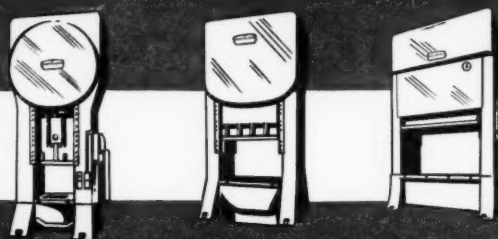
THE CLEVELAND CRANE & ENGINEERING CO.

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WICKLIFFE, OHIO.

STEELWELD *PIVOTED BLADE* SHEARS

MODERN

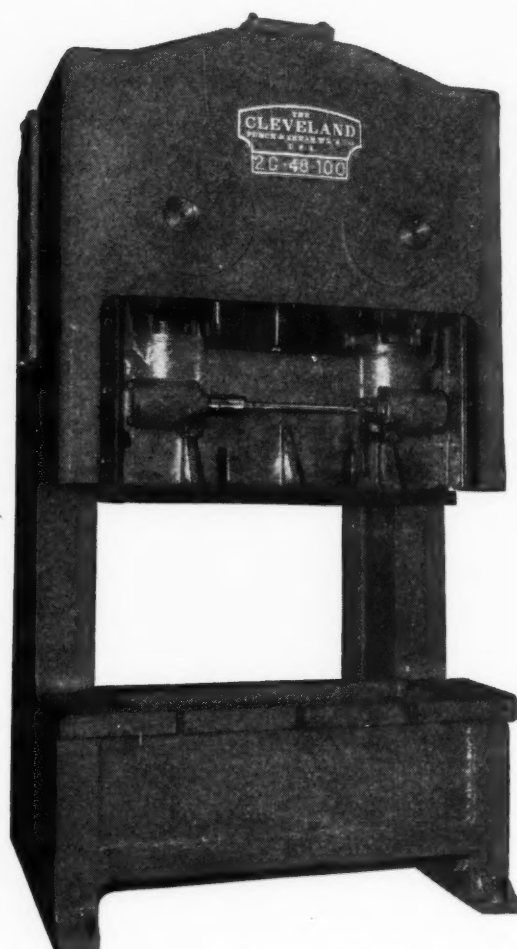
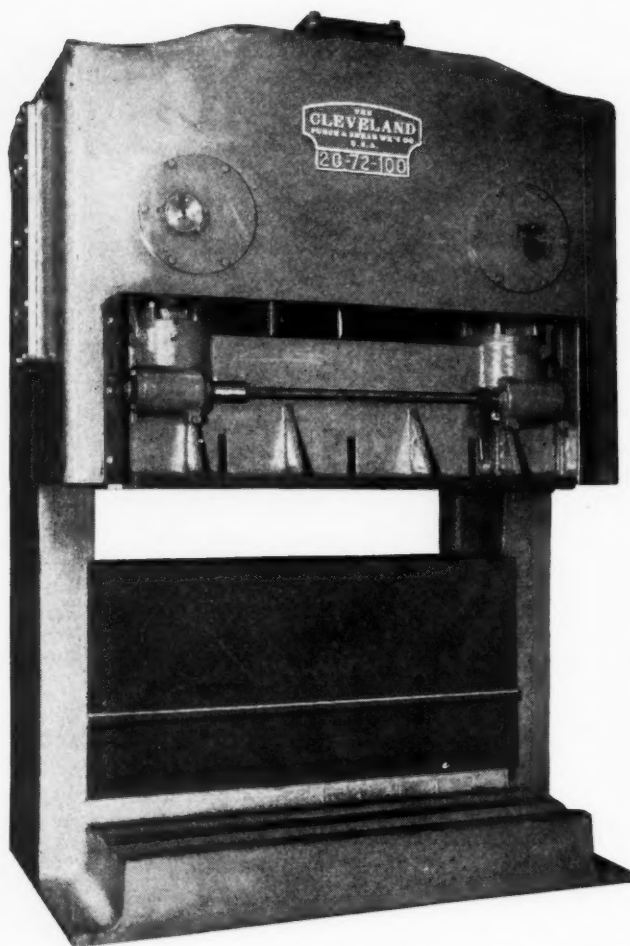


Straight-sided Presses

Single Point Two Point Four Point

and **NOW—**

MODERN Two Point GAP Presses!



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CLEVELAND

it's modern!

These Modern Two Point Open Back Gap Presses have been developed along the lines of our Modern Straight Sided Presses, with the gears, flywheel and drive unit located in the box type crown.

This design not only eliminates all overhanging brackets and other projections but it also provides more ruggedness and greater accuracy to the machine, as well as saving valuable floor space.

The 2G-72-100 Press, which has the lower section of the bed cut back, has a stroke of 10", adjustment 4", capacity 100 tons and operates at 35 strokes per minute.

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Both of these Modern Cleveland Presses are equipped with an electrically controlled hydraulically operated friction clutch but an air operated friction clutch can be furnished, if desired.

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New York • Chicago • Detroit • Philadelphia • Pittsburgh



Let a BALDWIN ENGINEER Help You Complete This Picture

You may—with a hydraulic press—be able to turn raw material into a finished product in a single step, eliminating separate operations. You may be able to add strength, utility, and attractiveness to your product, by *forming* instead of *fabricating* it. You may be able to step up output, and reduce rejects, because of the precision with which a press duplicates its production.

A BALDWIN FIELD ENGINEER will help you identify the operations that a Baldwin Hydraulic Press can do faster, better, more profitably.

BALDWIN ENGINEERING will give you the *custom-built* quality and features that can be designed into the *standard* line of Baldwin presses.



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Talk About PRODUCTION Without DIES!

Send for Catalog . . . showing DI-ACRO Precision Machines and many examples of parts made with "DIE-LESS DUPLICATING."



← Pronounced "DIE-ACK-RO"

4,000 Parts Per Day With DI-ACRO Bender

Here is an example of "DIE-LESS DUPLICATING" typical of a great variety of formed parts readily made with DI-ACRO Precision Machines,—Benders, Brakes, Shears. Picture shows the finished part formed to die precision, including acute right angle bend. Women operating DI-ACRO units maintain a high out-put on production work.



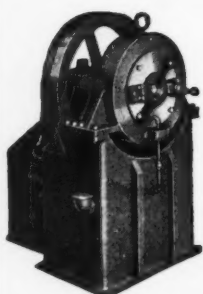
"Enclosed picture in our plant proves the DI-ACRO Bender will do a real production job. We are making 4,000 completed parts per day which is competitive to most Power Presses." (Name on request.)



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Present Owners of Torrington Swaging Machines are quoted promptly on request for prices for die renewals; etc.

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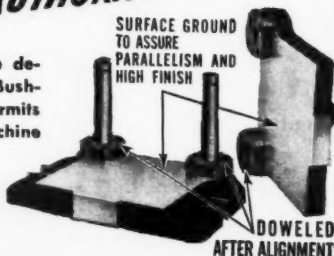
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All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver.

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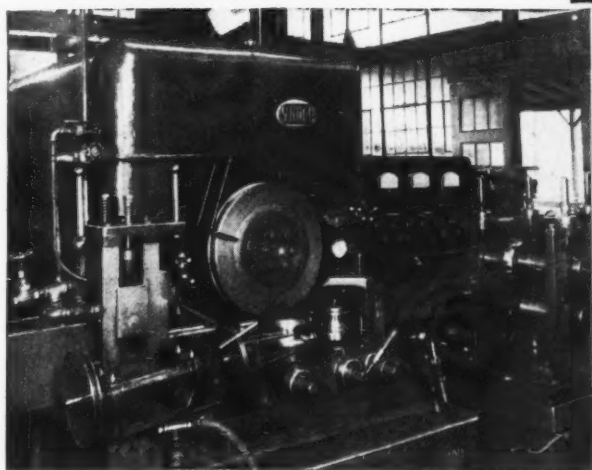
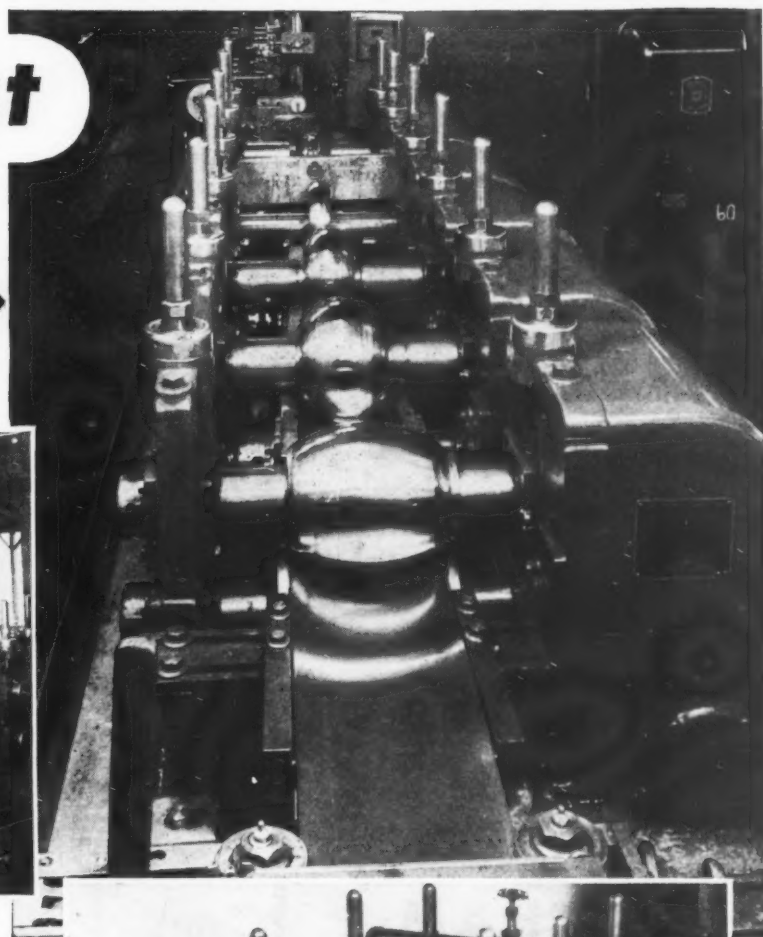


MULTIPLE SPINDLE LATHES
MULTIPLE SPINDLE GRINDERS
WIRE FORMING MACHINES
FOOT AND POWER PRESSES
TUMBLING EQUIPMENT

THE BAIRD MACHINE COMPANY
STRATFORD, CONN.

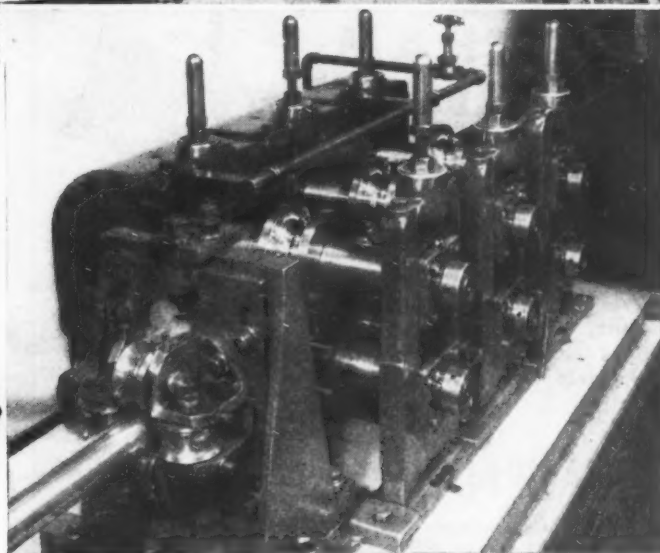
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YODER forming mill accurately and swiftly (up to 150 feet per minute) forms tubing from flat strip steel with matched sets of graduated steel rolls. This is a six-stand 2 1/4" mill. Other Yoder Mills available in capacities from 1/4" to 36" O.D.



YODER parallel-electrode high efficiency resistance welder welds butted edges of formed tube as it comes from the mill, then strips flash so smoothly no seam shows. There's a Yoder welder sized to each mill capacity —up to 1,500 KVA.

YODER sizing mill straightens and accurately sizes tubing (round, square, or elliptical as desired). Automatic cutoff delivers desired lengths at the speed of the mill. Other types of Yoder mills form moulding, angles or channels of every conceivable cross section.

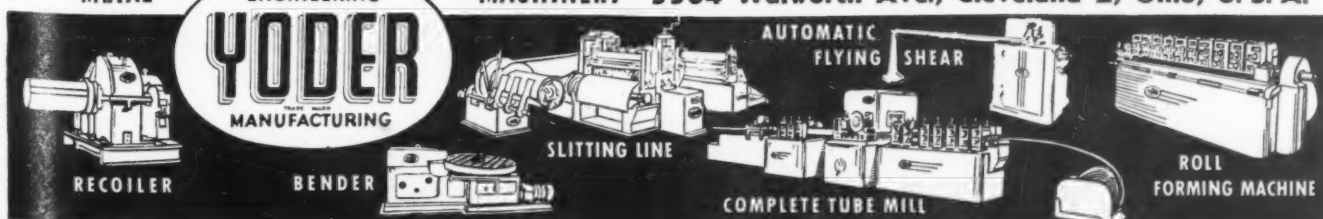


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THE YODER COMPANY

METAL WORKING • PRODUCTION • MACHINERY

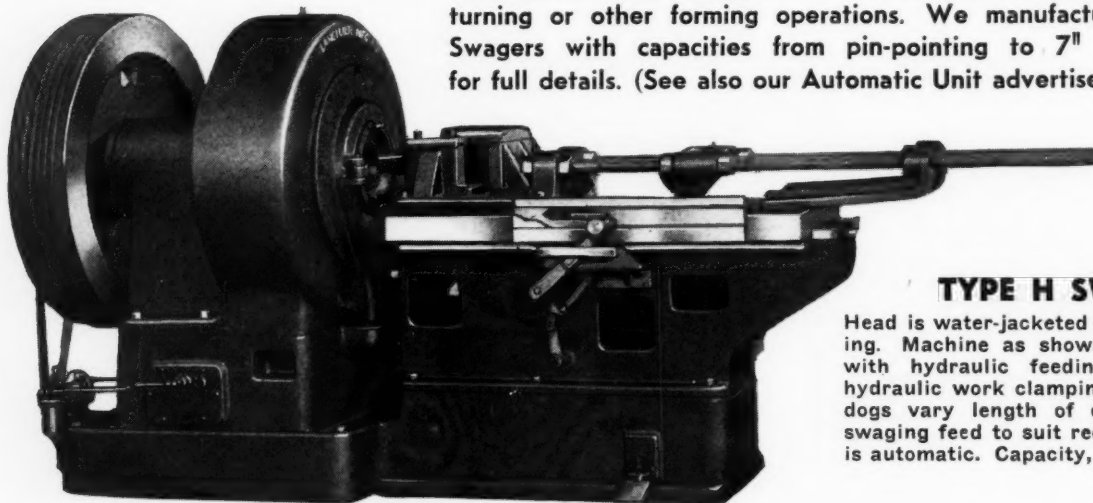
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Save BY PUTTING YOUR WORK ON LANGELIER NEW DESIGN SWAGERS

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You can effect important savings in machining costs by using modern LANGELIER Swaging Machines. Economical, practical, rapid! Production from one of these Swagers is, in almost every case, greater than with turning or other forming operations. We manufacture many types of Swagers with capacities from pin-pointing to 7" dia. tubes. Write for full details. (See also our Automatic Unit advertisement in this issue.)



TYPE H SWAGER

Head is water-jacketed for hot or cold swaging. Machine as shown here is equipped with hydraulic feeding mechanism and hydraulic work clamping jaws. Adjustable dogs vary length of quick advance and swaging feed to suit requirements. Return is automatic. Capacity, tubing, 3".

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DRILLING AND SWAGING SPECIALISTS FOR OVER 50 YEARS... INCORPORATED 1887

WALTHAM SUB-PRESSES

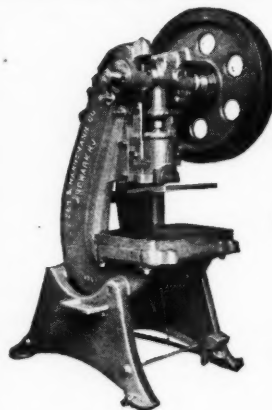
PLUNGER BEARINGS are ADJUSTABLE for wear. For this reason, WALTHAM SUB PRESSES will maintain their original alignment and assure accurate results for the life of the die. Overhang type is designed to allow plenty of light for locating second or third operations. Arch type is ideal for strip work. Write for full information.

FOR
CLEAN-CUT
STAMPINGS!

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TRADE MARK - REG. U. S. PATENT OFFICE
MACHINE WORKS
Newton Street,
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Makers of Small Thread
Millers, Gear Cutters and
other Small Automatic
Machines.

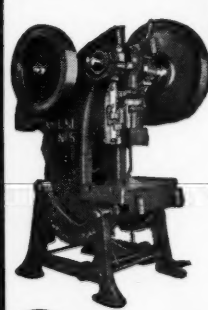


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of all types and sizes

ZEH & HAHNEMANN CO.

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**INCLINABLE
POWER PUNCH
PRESSES**

5 TO 75 TONS

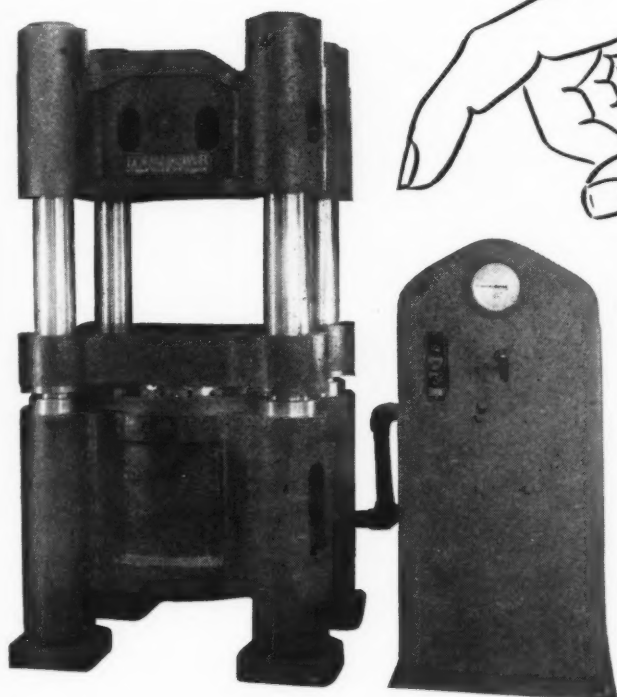
No. 5 BACK GEARED

49 Ton Capacity
45 Strokes per minute
*10 1/4" Die Space
(Bed to slide, stroke down, adj. up)
4" Standard Stroke
6700 lbs. weight
Also available in plain flywheel type
*No. 5 Special has 15 1/4" Die Space
Write for Catalog.

L & J PRESS CORP. *Elkhart, Ind.*

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SUCCESSORS TO LOSHRUGH JORDAN TOOL & MACHINE CO.

FARQUHAR'S AUTOMATIC FINGER-TIP CONTROL APPEALS TO HYDRAULIC PRESS OPERATORS!



600 Ton 4 Column
Self-Contained Hobbing Press

Stroke	12"
Daylight	18"
Clearance between Columns, Left to Right.....	25"
Moving Platen, Front to Back.....	24"

Farquhar

Column Type Presses Assure
Easy Operation and Diversified Performance!

These Farquhar hydraulic presses appeal to your operators as well as your production manager. Here's why:

EASY TO OPERATE: They like Farquhar presses because they are easier to operate . . . with efficient finger-tip control.

DEPENDABLE: You can depend upon Farquhar self-contained presses, too, because accurate guides insure a rigid moving platen . . . sturdy frames minimize deflection and weaving under capacity tonnage.

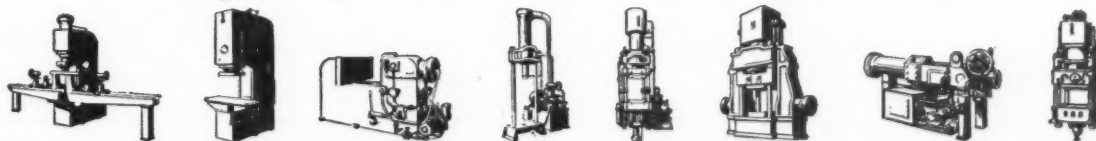
FLEXIBLE: Production men also prefer Farquhar column type presses because they're adaptable to almost any operation involving metal or rubber.

Operators and production men both acclaim the efficiency of these Farquhar hydraulic presses in the following operations:

- SHEARING
- COINING
- EMBOSSING
- LAMINATING
- HOBBING
- FORMING
- DRAWING
- MOLDING

Consult FARQUHAR today for . . . easy press operation . . . diversified production performance.

Farquhar Builds the Press You Need



STRAIGHTENING PRESSES • GAP PRESSES • COLUMN TYPE PRESSES • DOUBLE ACTION PRESSES • FORGING AND PIERCING PRESSES • STAMPING PRESSES • DRAWING PRESSES

1856

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1946

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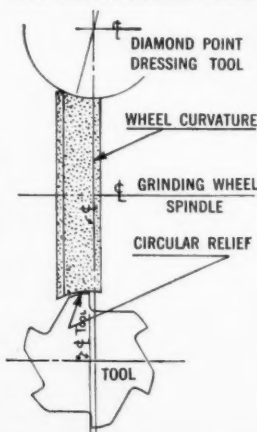
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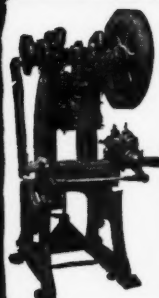
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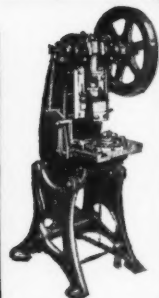
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from strips through cut lengths.

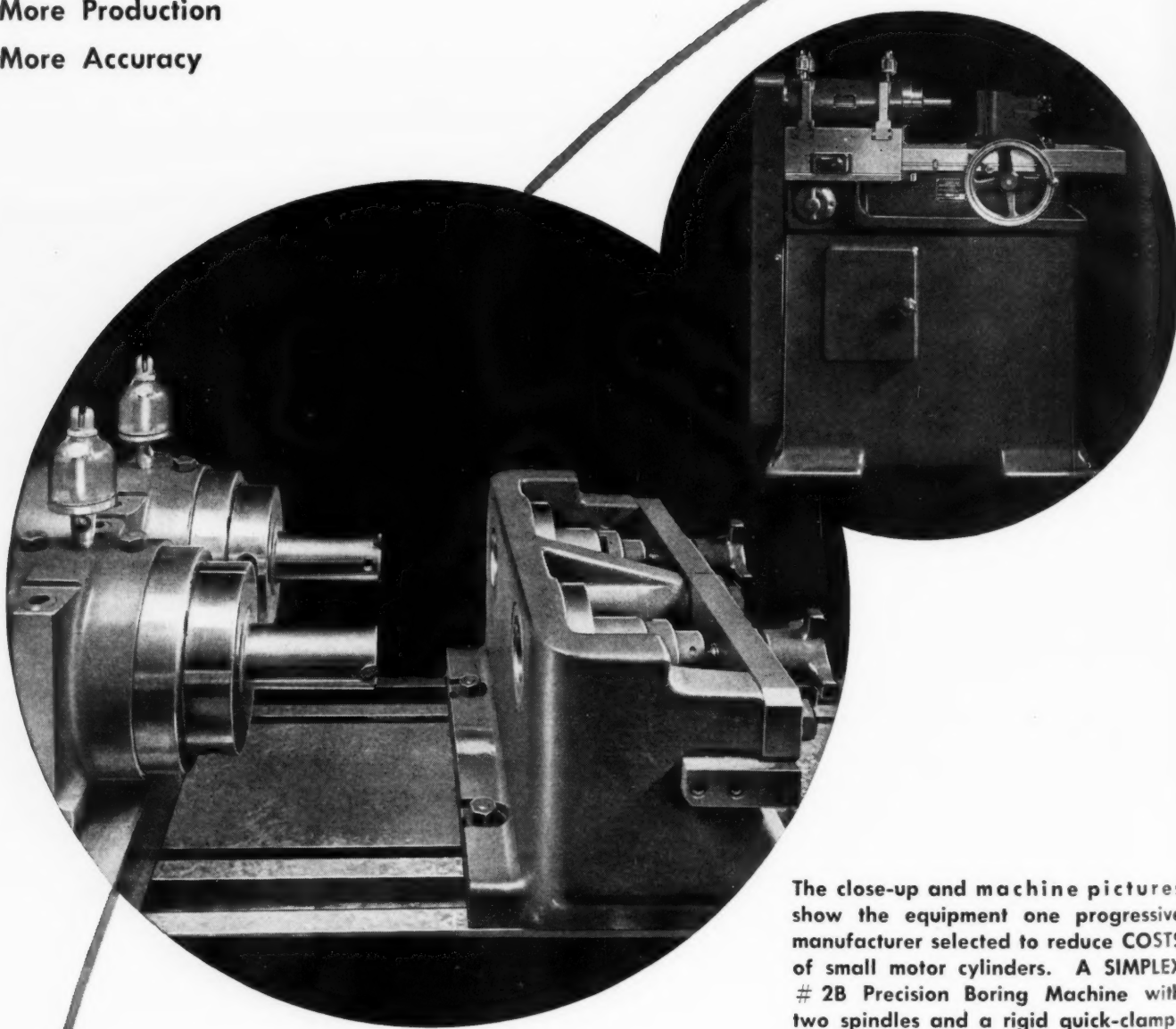
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More Production
More Accuracy

SIMPLEX



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Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

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Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

380—MACHINERY, September, 1946



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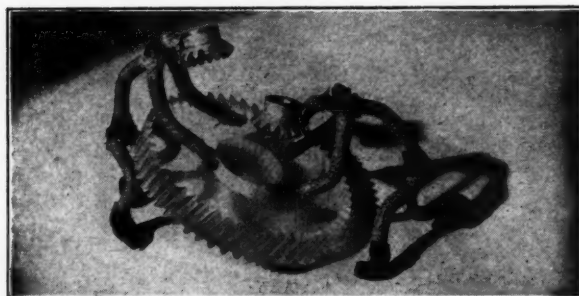
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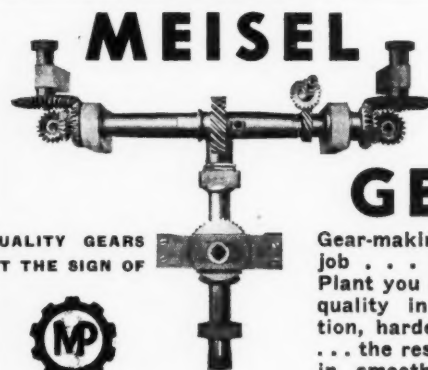
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PRECISION GEARS UP TO 200 DIAMETRAL PITCH
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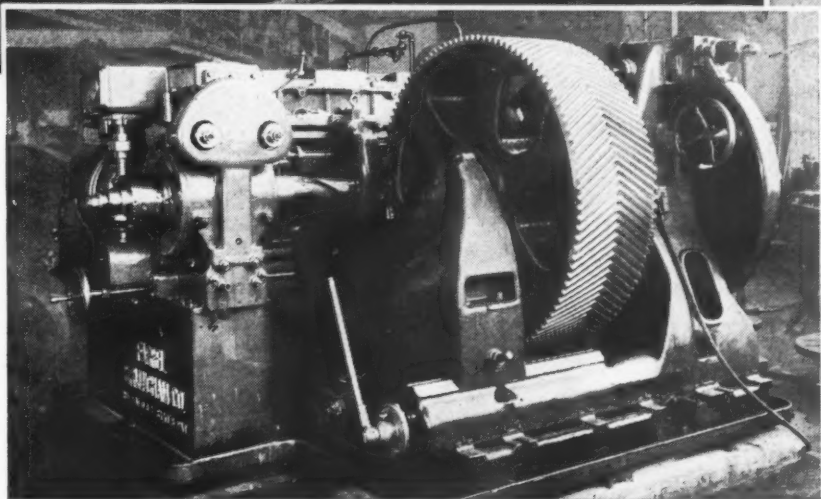
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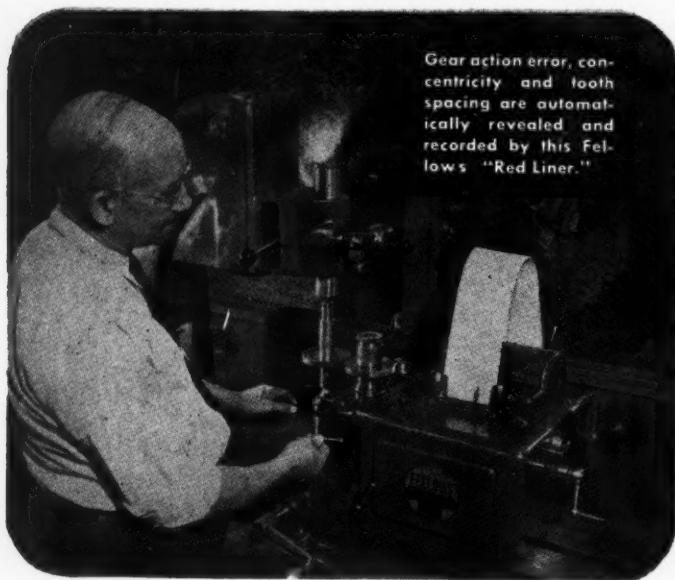
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Gear action error, concentricity and tooth spacing are automatically revealed and recorded by this Fellows "Red Liner."

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384—MACHINERY, September, 1946

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Radial,
Radial,
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Thrust,
Thrust,
Wheels

BEARING
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BUSHING
Steel (

CHAIN
Block
Ladder
Ladder
Ladder
Roller,
Roller,
Roller,
Roller,
Stud,

COLLAR
Setscrew

COUPLER
Flexible
Flexible
Multi-
Sleeve
Three

GAUGE
6 to

GEAR
Brass
Steel

GEAR
Bronze
Steel

GEAR
Brass

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Radial, Single Row, Ground
Radial, Single Row, Precision
Radial, Single Row, Unground
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Thrust, Ground
Thrust, Ground, Heavy Duty
Thrust, Light Duty
Thrust, Unground
Wheels, Pressed Steel

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Bronze, Precision, Oil-Cushion

BUSHINGS

Steel (For Hole Reduction)

CHAIN

Block
Ladder, Brass, Small Pitch
Ladder, High Tensile Steel, Small Pitch
Ladder, Steel, Small Pitch
Roller, Attachment, Standard
Roller, Double
Roller, Single, Non-Corrosive
Roller, Single
Stud, Small Pitch

COLLARS

Setscrew, Standard Shafting

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Sleeve, Steel
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6 to 80 Diametral Pitch

GEARS, BEVEL

Brass, Small Pitch
Steel and Iron

GEARS, HELICAL

Bronze
Steel, Hardened

GEARS, INTERNAL

Brass, Small Pitch

GEARS, MITER

Brass, Small Pitch
Iron
Steel

GEARS, MITER, SPIRAL

Steel

GEARS, SPUR

Brass, Small Pitch
Brass, Sheet, Small Pitch
Change Gear Type
Fabroil
Non-Metallic
Pinions, Stem, Steel (5-10 Teeth)
Steel, Small Pitch
Steel and Iron
Steel and Iron (20° P.A.)

GEARS, WORM

Bronze, Single Thread
Bronze, Single Thread, Small Pitch
Bronze, Double Thread
Bronze, Double Thread, Small Pitch
Bronze, Four Thread
Bronze, Four Thread, Small Pitch
Iron, Single Thread
Iron, Double Thread
Iron, Four Thread

PILLOW BLOCKS

Ball Bearing, Flanged Cartridge Type
Ball Bearing, Self Aligning
Ball Bearing, Welded Steel
Cast Iron, Split
Cast Iron, Split, Oilite Bearing

PINION WIRE

Brass
Steel

PULLEYS

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Iron, Cone, Round & V-Belt
Iron, Grooved, Round Belt
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Steel
Steel (20° P.A.)

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Stud Chain, Brass

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Steel, Unbored

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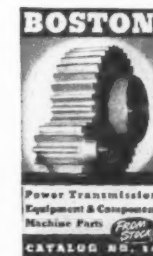
WORMS

Steel, Single Thread
Steel, Single Thread, Small Pitch
Steel, Double Thread
Steel, Double Thread, Small Pitch
Steel, Four Thread
Steel, Four Thread, Small Pitch
Steel, Hardened and Ground
Steel, Unhardened



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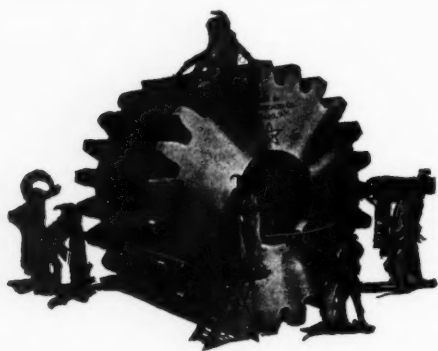


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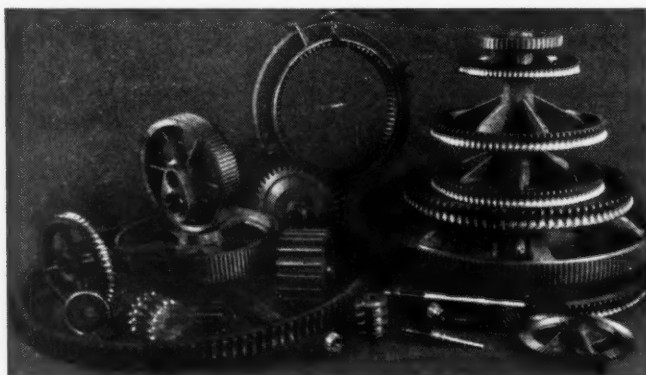


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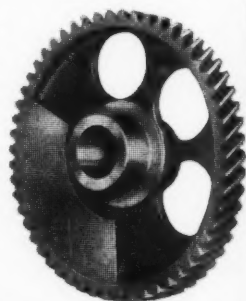
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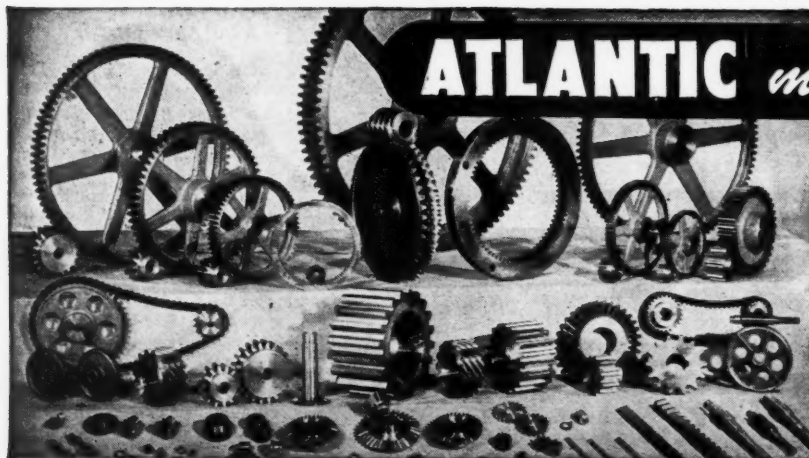
- ★ SPUR
- ★ BEVEL
- ★ HELICAL
- ★ SPLINE
- ★ WORM
- ★ SPECIAL



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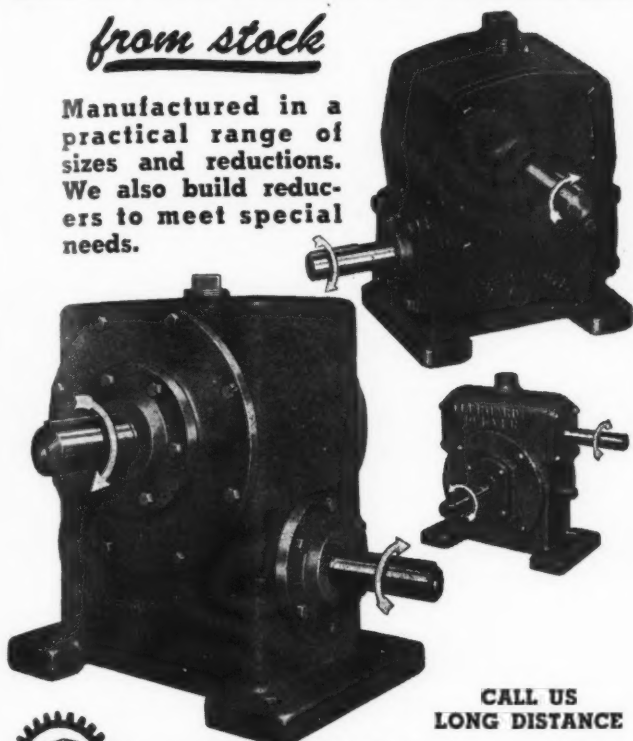
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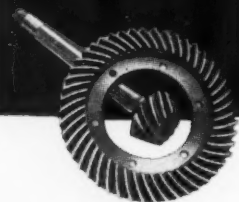


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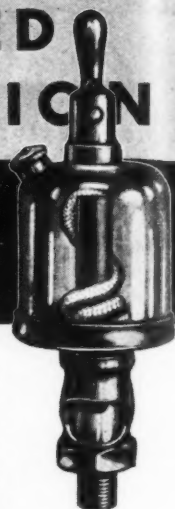
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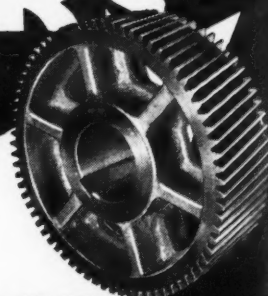
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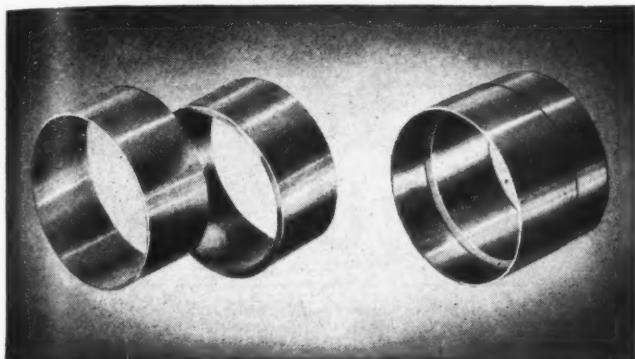
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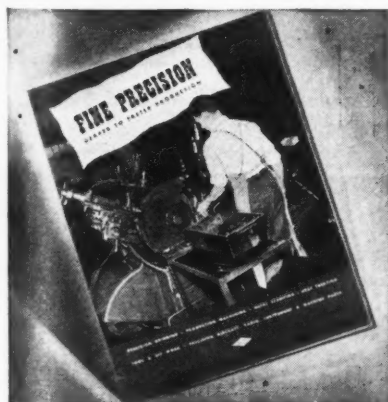
A FREE FIT ...BUT NOT LOOSE



Laboratories that in peace as in war are pacing the advance of American industry demand accuracy above everything else. It is no wonder, then, that one of the largest laboratories in America came to ACE for these pressure support rings.

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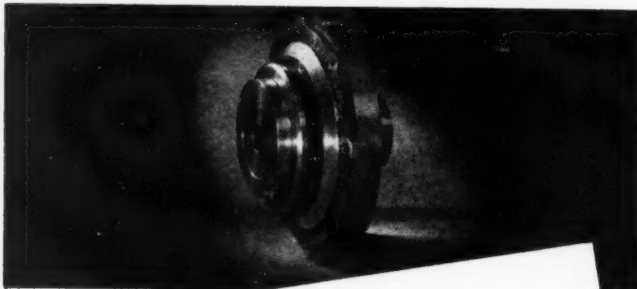
BALL BEARING
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FOR ALL PURPOSES

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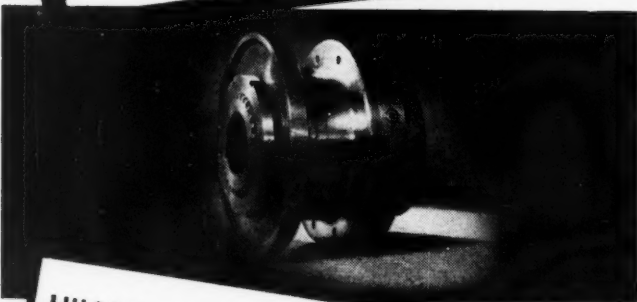
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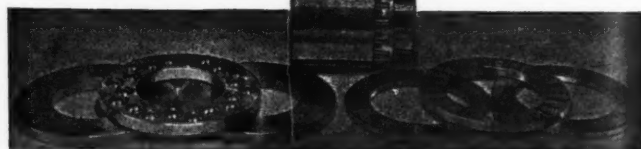
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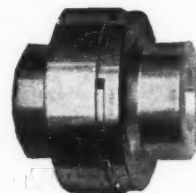
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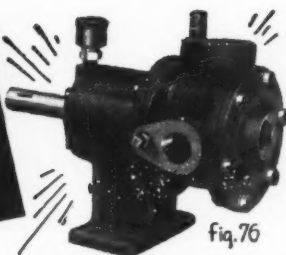
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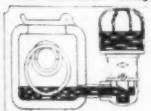
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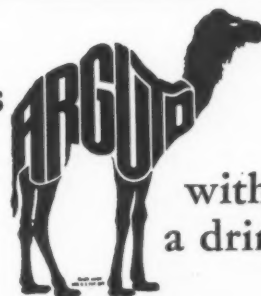
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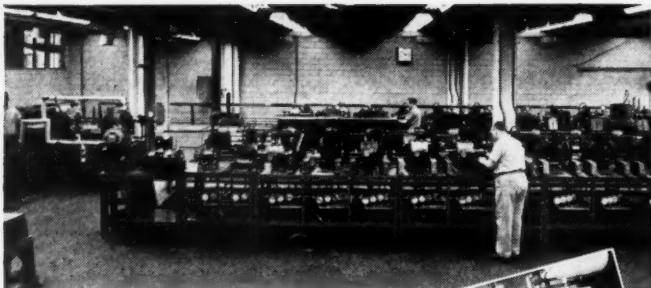
without
a drink—

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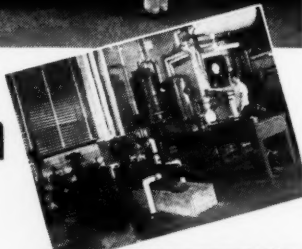
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for developing, improving and testing
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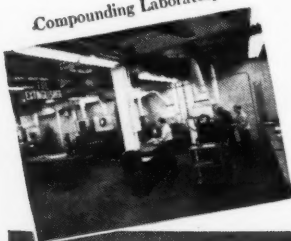
Top—Garlock Testing Laboratories general view.
Center—Another section of Testing Laboratories.
Lower—Chemical Laboratory

YEARS AGO, when little was known about the laws governing "packing mechanics," The Garlock Packing Company entered into research in the field of mechanical packings. Year by year, as new industrial equipment and processes came into use, Garlock's research expanded.

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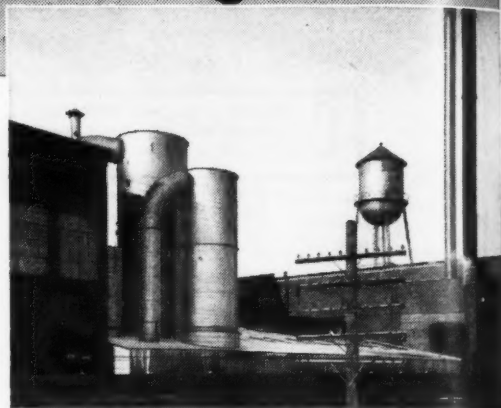
* In Canada:

The Garlock Packing Company
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GARLOCK

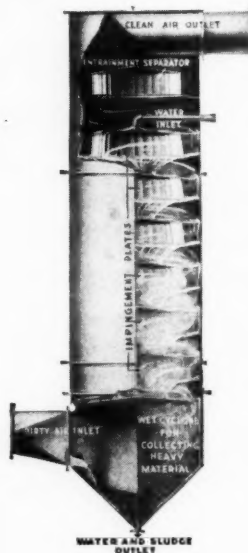
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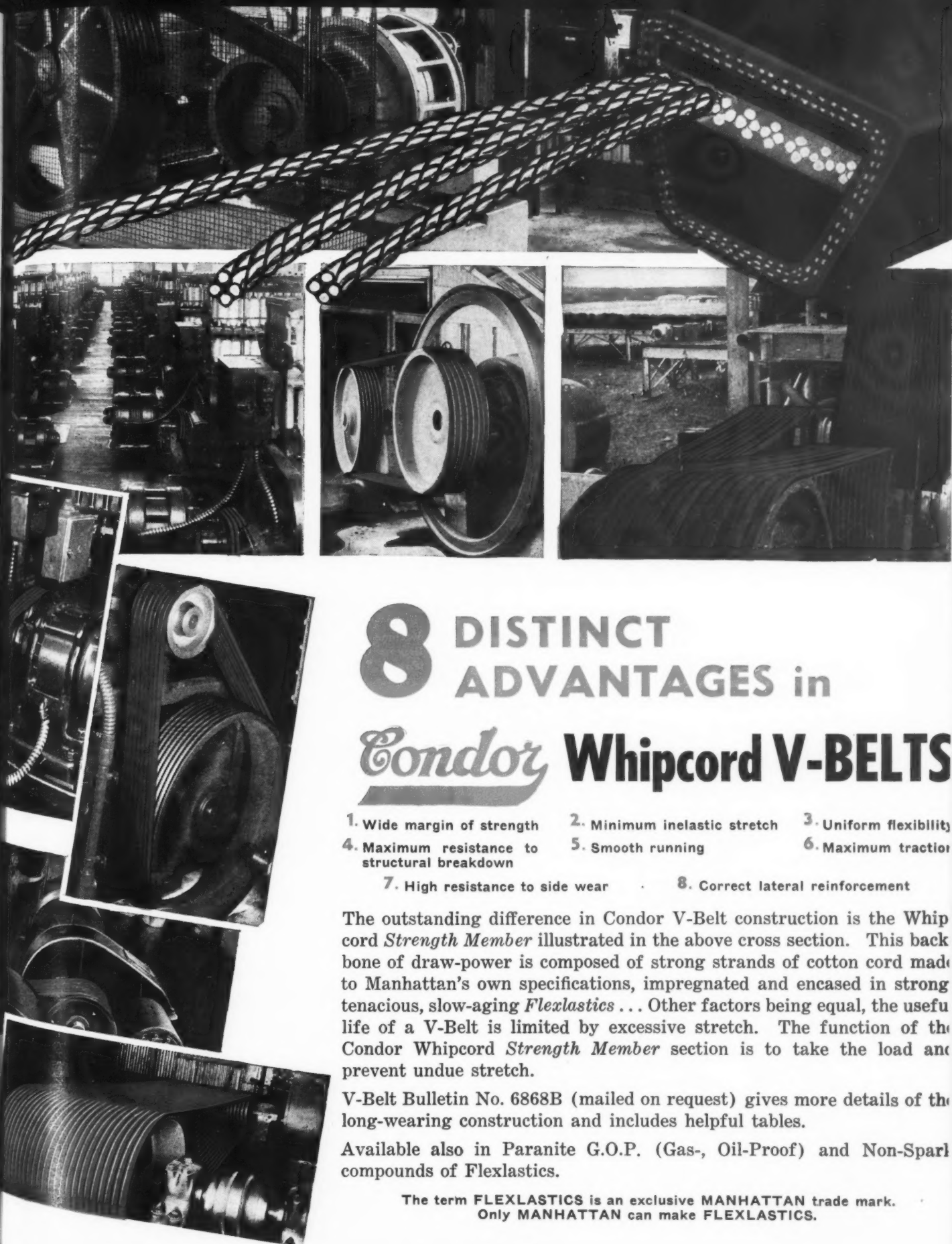
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Only MANHATTAN can make FLEXLASTICS.

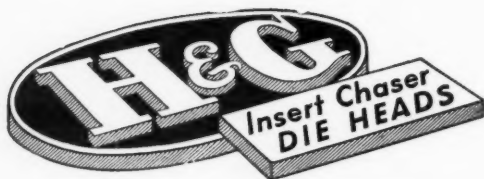
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Sizes and styles for all machines on which threads are cut. Write for literature.

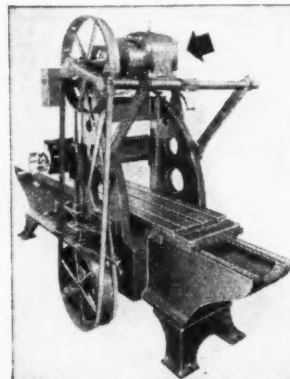
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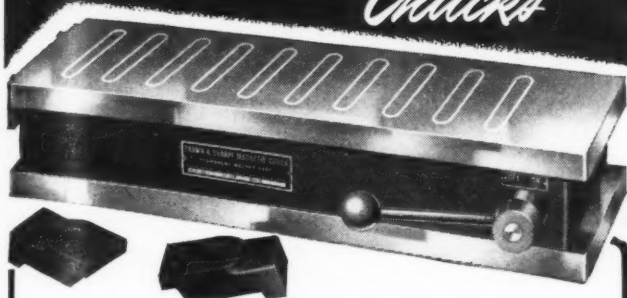
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WHELOCK, LOVEJOY & CO., Inc.


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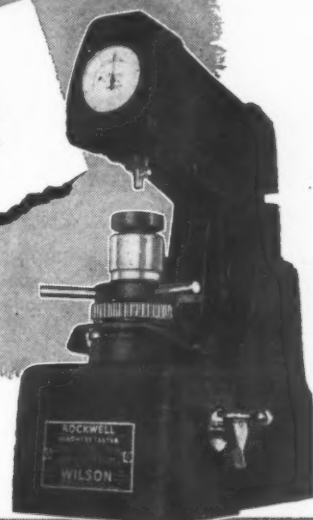
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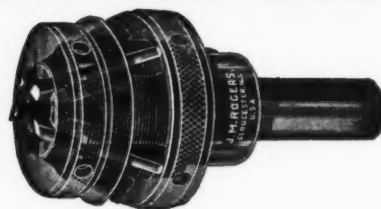
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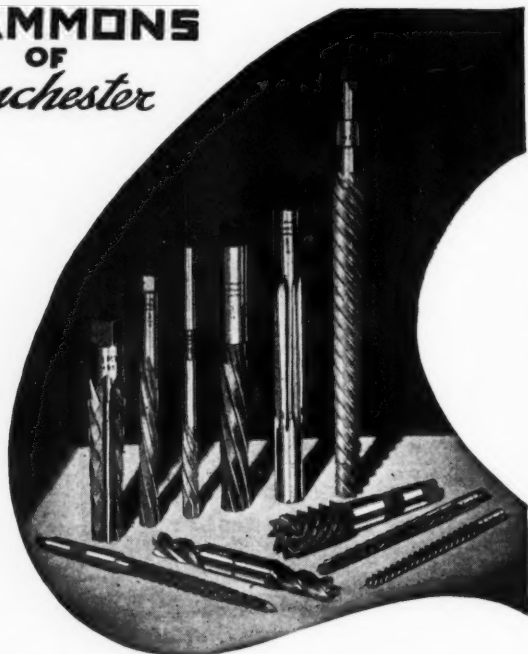
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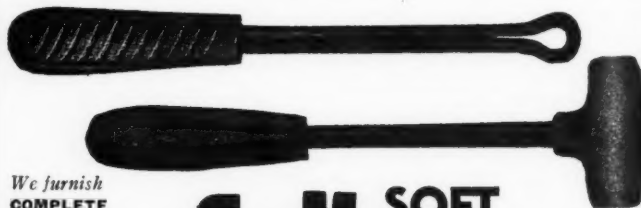


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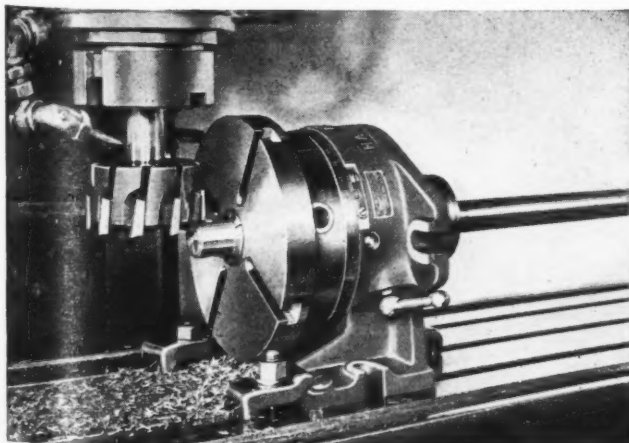
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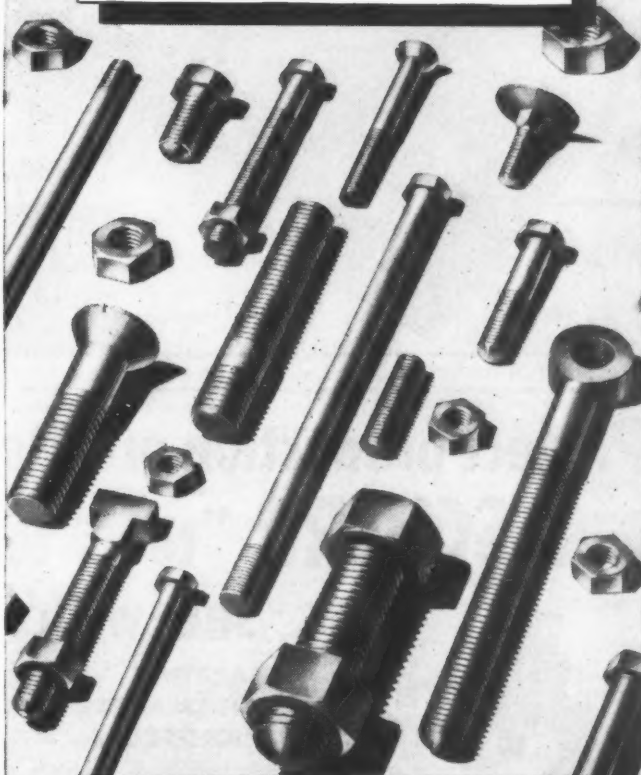
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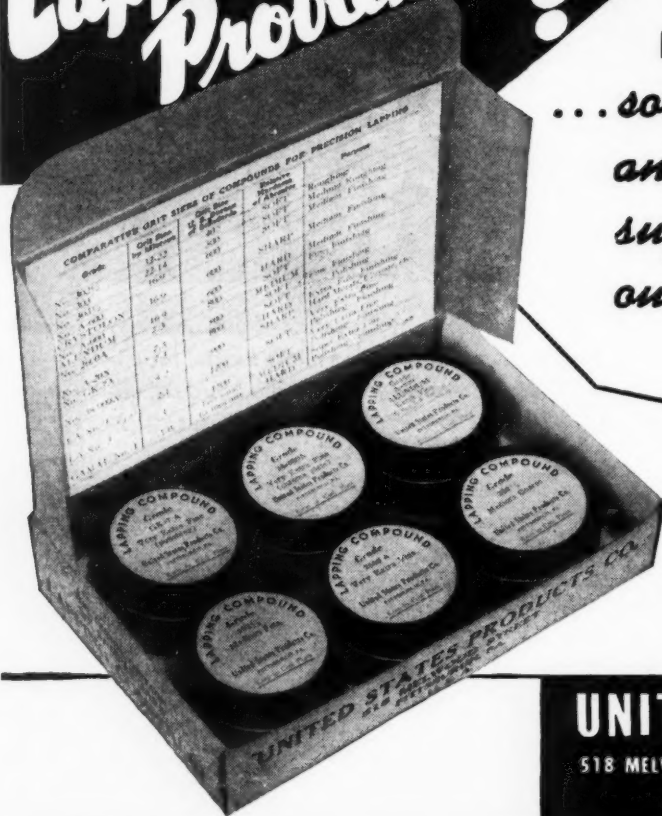


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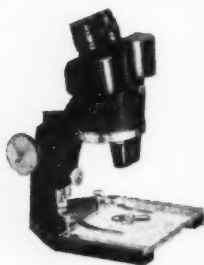
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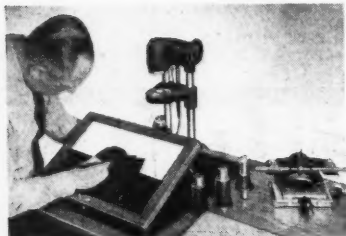


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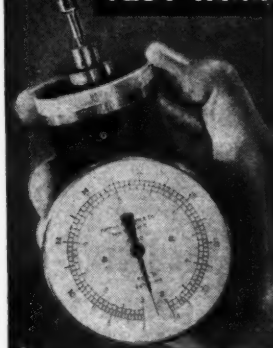
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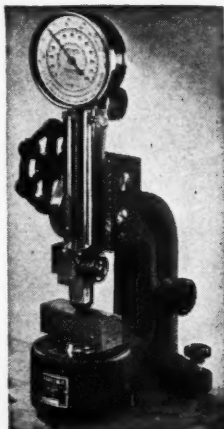
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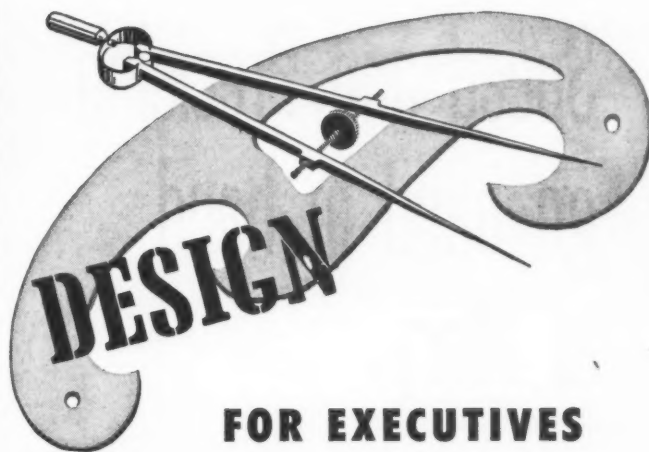
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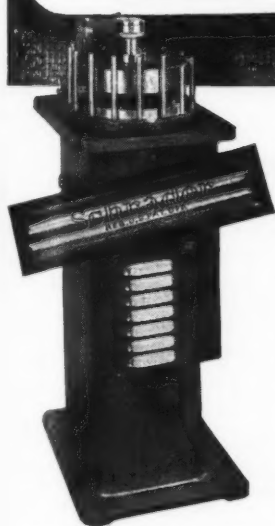
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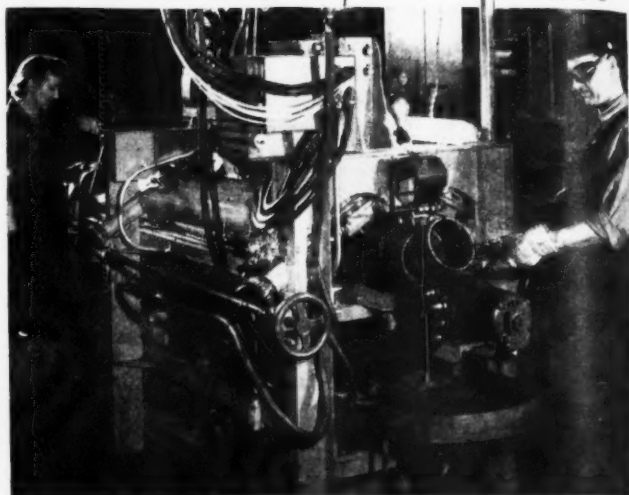
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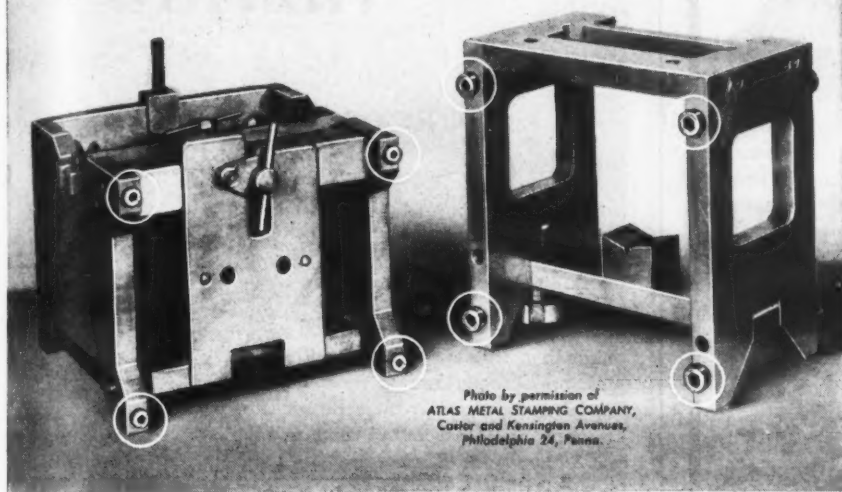


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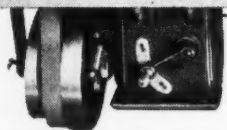
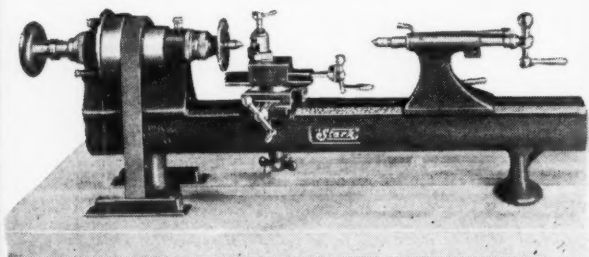
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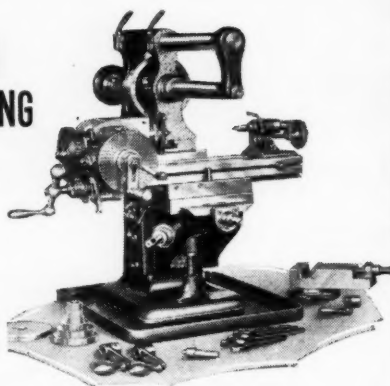


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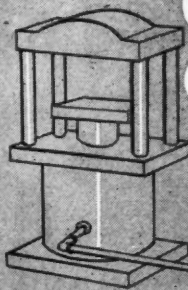


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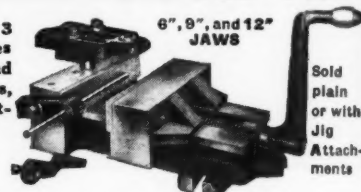
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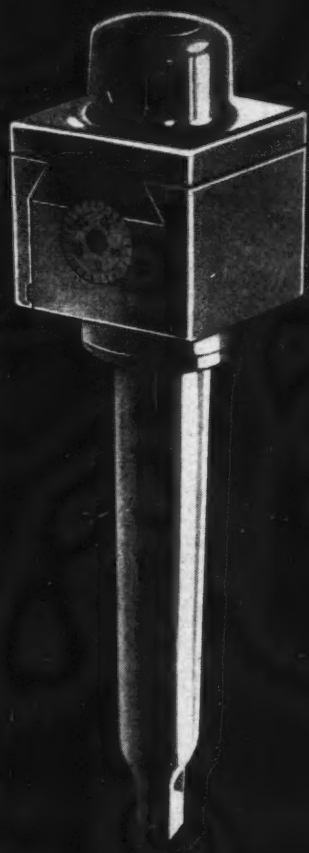
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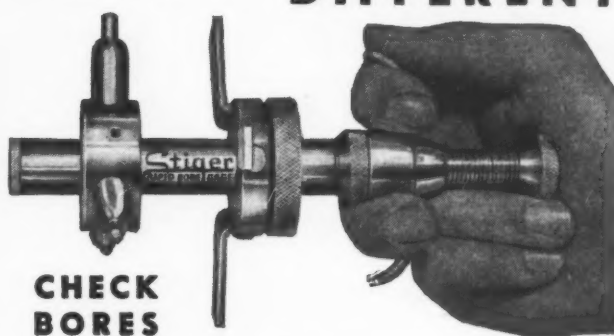


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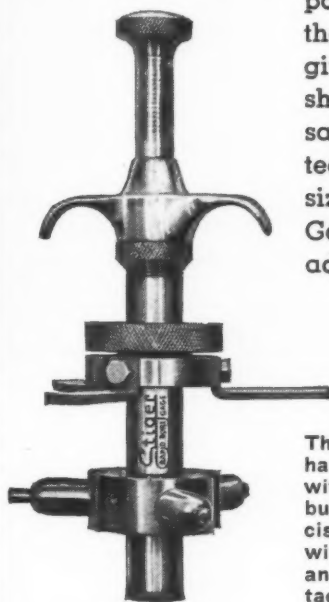


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14" x 54" REED PRENTICE MODEL B TOOL ROOM, Taper attachment, chuck, M.D. (2).

20" x 25" FAY AUTOMATIC LATHES, M.D. Air chuck (4).

6" MODEL C SUNDSTRAND AUTOMATIC PRODUCTION, New 1939, Air chuck, 11" swing, 43" length of bed, Coolant pump, M.D. (2).

NO. 4-A WARNER & SWASEY UNIVERSAL TURRET LATHE, Grd. Hd., 8 1/4" hole, M.D. 24" chuck.

NO. 3-L GISHOLT TURRET LATHE, Timken Bearing Spindle, 6" hole, 26 1/2" swing, A.C. motor in base, All grd. head, Power feed, Rapid traverse.

MILLING MACHINES

NO. 2-MH CINCINNATI PLAIN MILL, Grd. Hd., Timken bearings, Rapid traverse, 10 1/2 x 52 1/2" table; Motor in base. Dial feed.

NO. 2 VAN NORMAN PLAIN MILL, Grd. Hd., Timken Bearing spindle, Rapid traverse, Motor in base; 12 x 50" table; Coolant pump.

NO. 9-J GORTON VERTICAL MILLS, 10 1/2 x 35" table, M.D. (2).

NO. 2 CINCINNATI, VERTICAL MILL, Adj. head, A.C. motor in base, 12x52" table, Dial type.

NO. 2-K KEARNEY & TRECKER VERTICAL, Motor in base, Adj. Grd. Head, Dial Type.



18" CINCINNATI PLAIN MFG. TYPE MILL, New 1941, Grd. Head, 7 1/2" x 26 1/2" table; Coolant pump, M.D.

NO. 36 DEVLIEG ELECTRIC TOOL PRODUCTION MILL, B. G., 15 x 66" table; A.C. motor in base; Coolant pump.

4" x 9" HANSON WHITNEY THREAD MILLS (3), New 1941, 33" bed, 9" bet. centers, Air chuck, Coolant pump, A.C., M.D.

NO. 9-U-3 NATCO 3-WAY HYDRAULIC DRILLING AND BORING MACHINE, New 1942.

1 3/4" hole; each head individually driven.

FOX HORIZONTAL HYDRAULIC BORING AND DRILLING MACHINES, New 1941.

FOX VERTICAL HYDRAULIC BORING AND DRILLING MACHINES, New 1940.

NO. 228 CHICAGO STEEL POWER APRON BRAKE, 12 ft. long, 1/2" capacity, M.D.

KANE AND ROACH ANGLE ROLL, M.D. with 7 1/2 H.P. Motor, 2 x 2 x 1/4" capacity.

1" FOOTE BURT 6-SPINDLE SCREW MACHINE, M.D., New 1941.

7/8" 4-SPINDLE NEW BRITAIN, Threading Spindle, Late Type, with chip conveyor and reel, New 1938.

3/4" CITY ENG. (CECO) SWISS TYPE AUTOMATIC SCREW MACHINE, New 1942 (2).

1 1/2" MODEL AA CLEVELAND SCREW MACHINES, Single Spindle, M.D. (2).

NO. 7A DOUGLAS VERTICAL SLOTS, 7" stroke, M.D. (3).

Send for free copy of our "MACHINERY MART."

INTERSTATE

Machinery Co., Inc.
1451 W. PERSHING RD., CHICAGO 9, ILL.

WANTED—Sales Engineers

Sales Engineers . . . as representatives on commission basis in the following territories: New York City and New Jersey, Philadelphia, Detroit, Cincinnati, St. Louis, San Francisco, the States of Washington, Oregon, Texas, Alabama, Tennessee and the southeastern section of the United States; to sell Electronic and Manual Gages and engineer applications for same in the field, also Rotary Cutters. Can be handling one or two other products. Must have selling ability, technical and mechanical knowledge. State age, firms or products representing and give references. Box No. 387, MACHINERY, 148 Lafayette Street, New York 13, N. Y.

SHOP SUPERINTENDENT

Old established machinery manufacturer located within sixty miles of New York requires shop superintendent for modern machine and assembly plant with about 250 employees.

Want practical man who is thoroughly versed in all phases of machine shop practice, with proven executive capacity and ability to get along well with others.

Mail complete summary of experience. State salary expected. Replies will be held confidential. Box No. 386, MACHINERY, 148 Lafayette Street, New York 13, N. Y.

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Excellent opportunities for men experienced in heavy machinery, plant layouts, foundations, industrial furnaces, piping or similar work.

Apply

Employment Office
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

WANTED FOR CASH

One only USED—quick change gear—heavy duty—screw—cutting triple geared engine lathe.

SPECIFICATIONS:

24 speed—swing over ways 61"—swing over saddle 46"—distance between centers, base length 4'-4", bed length approximately 14'-0", together with all accessory equipment. With or without motor drive which should be 60 cycle, 550 volts, 3 phase.

Offers for a Lathe of the above specifications or anything resembling same, even if slightly different dimensions, should be sent to advertiser. POLYMER CORPORATION LIMITED, Sarnia, Ontario.

FOR SALE

2400 lbs.—2 1/2"—X1112 Round Shafting.

2500 lbs.—1-7/16"—X1112 Round Shafting.

174 lbs.—1/2"—X1335 Round Shafting.

2000 lbs.—3" x .018" thick Armco Special Electrical Lamination Steel, fair condition.

200 lbs.—2 3/4" x .015" thick SAE 1010 Lamination Steel, 6' to 8' random lengths, fair condition.

250 lbs.—3-3/16" x .015" thick SAE 1010 Lamination Steel, 6' to 8' random lengths, fair condition.

GENERAL ARMATURE & MFG. CO.,
Lock Haven, Pennsylvania

EQUIPMENT DESIGNER

This man should be a graduate engineer with some experience in the design of light semi-automatic production equipment.

PRODUCTION DESIGNER

This man should be a graduate engineer. Experience in product design and a general knowledge of materials and methods of manufacture is desirable. BURGESS BATTERY COMPANY, Freeport, Illinois.

ASSISTANT SALES MANAGER by a leading manufacturer of automatic mechanical presses and press accessories. Position involves office duties chiefly with only limited traveling required. Excellent opportunity for capable man with broad experience in metal fabrication or allied fields. State full experience, age, education and salary expected. Write Box No. 385, MACHINERY, 148 Lafayette St., New York 13, N. Y.

CIMSCO Rebuilt Machine Tools

LATHES

36"x30' Lodge & Shipley Grd. Hd.
2 Carriages.
24"x10' American Grd. Hd. 8 speed, Q.C.

GEAR CUTTERS AND HOBBERS

No. 12 Barber-Colman D.O.A. Hobber, M.D.
No. 6—60" Brown & Sharpe Gear Cutter.
6" Bilgram Bevel Gear Generator.

GRINDERS

Lees-Bradner Gear Grinder.
10"x96" Landis Plain Self-contained.
12"x36" Cincinnati Universal Hydraulic.

MILLING MACHINES

No. 4 Cincinnati Dial Type Medium Speed,
A.C., M.D.
No. 1 1/2 B Milwaukee Universal, M.D.

RADIAL DRILLS

6' American Triple Purpose, M.D.
6' Cincinnati-Bickford, M.D.
7' Cincinnati-Bickford, M.D.

MISCELLANEOUS

36" Bullard New Era Vertical Turret Lathe.
24"x24"x10' Powell Planer, 2 Hds, M.D.
42" Bullard, 2 Heads, Self-contained type.
No. 307 Barnes Honing Machine, M.D.
No. 4A Warner & Swasey Univ. Hollow
Hex, 9" hollow spindle, A.C.M.D. Chuck
and Bar feed.
No. 4A Warner & Swasey Univ. Hollow
Hex, Turret Lathe, 12" hollow spindle
—A.C.M.D.—latest type.

If machines you need are not listed above, send
us your inquiry. We have a very large stock.

Cincinnati Machinery Co., Inc.
217 E. Second St., Cincinnati 2, Ohio

WANTED Late Models

2 No. 50 Waterbury-Farrel
Thread Rollers
1 1 1/2" National Upsetter
1 Zeh-Hahnemann No. 12 or
No. 16 Percussion Press

724 Dixie Terminal Building
Cincinnati 2, Ohio

WANTED SALES MANAGER

Experienced: Sales of Machine Tools,
Metal Fabricating Equipment. Sales Pro-
motion, organize territories, quotas, sys-
tems, reports, customer correspondence,
engineering Sales letters. Assume direct
charge of Salesmen.

An excellent opportunity with a Chicago
concern for an aggressively active Sales
organizer and Manager. Box No. 384,
MACHINERY, 148 Lafayette Street, New
York 13, N. Y.

MANUFACTURERS' AGENTS

Wanted by an old, well established company
manufacturing Milling Cutters, Reamers, and
Special Metal Cutting Tools. To sell on a
commission basis in St. Louis, San Francisco,
Baltimore and New Orleans territories. Agents
who are now selling allied, but non-com-
petitive lines. Box No. 150, MACHINERY,
148 Lafayette Street, New York 13, N. Y.

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NEW • USED • REBUILT

Meet Highest Engineering Standards

Write, Wire or Phone — Worcester 6-5175

● MILLERS

- 1—Kearney & Trecker No. 2K Vert., latest
type, tbl. wkg. surf. 56"x12", long. range
28", vert. 14", cross 12", M.D.
- 1—Cin. No. 3 Horizontal Plain Dial Type,
latest design, tbl. wkg. surf. 58 1/2"x15",
long. range 34", cross 12", vert. 20", A.C.
elec. equip.
- 1—B. & S. No. 1A Univ. Double Overarm
Timken Bearing, Motor in base, tbl. wkg.
surf. 40 1/2"x11 1/4", long. range 22", cross
8", vert. 18", A.C. elec. equip.
- 1—B. & S. No. 2 Univ. Cone Driven, tbl.
wkg. surf. 39 1/4"x8", long. range 28", vert.,
18", cross 10", M.D., with attachments.

● BORING MILLS

- 1—Bullard 24", 36" and 42" New Era Type,
with side head, M.D.
- 1—Colburn 48" Vert. Rapid Trav., height
under cross rail 44", 2 heads on cross rail,
M.D.
- 1—Niles 53" Vert., height under cross rail
44 1/2", rapid trav., M.D.

● LATHES

- P. & W. 16"x36" Model B 8 Speed Gr.
Hd., motor in base, pan bed, taper at-
tachments.
- 1—P. & W. 20"x48" Model B Pan Bed, taper
attachments.
- 8—Leland-Gifford 16"x8' Ball Bearing Spdle.
Cone Type, M.D., engine, actual swing
18 1/2", dist. btw. centers 50".

4—Leland-Gifford 16"x10' Ball Bearing Spdle.,
actual swing 18 1/2", dist. btw. centers 74".

1—L. & S. 16"x8' 12-speed Sel. Gr. Hd. Eng.,
M.D., swing over bed 18 1/2", dist. btw.
centers 54".

1—L. & S. 16"x6' 12-speed Sel. Gr. Hd. Pan
Bed, M.D. Eng., swing over bed 18 1/2", dist.
btw. centers 30 3/4".

1—P. & W. 16"x6' Model M 8-Speed Quick
Change Geared, Gr. Hd. Pan Bed M.D. Gen.,
taper attachment, swing over bed 16 1/4",
dist. btw. centers 34".

1—Bridgeford 36"x56' 15-Speed Gr. Hd. Eng.,
M.D., A.C. elec. equip. power rapid trav.
to carriage, swing over bed 38", swing
over carriage 26", dist. btw. centers 48",
taper attachment.

1—Reed-Prentice 27"x21' 12-Speed Gr. Hd.
Eng., swings 30", dist. btw. centers 15'2".

1—Whitcomb-Blaisdell 20"x25' Quick Change
Gear Double Back Gr., Cone Type, motor-
ized, swing over ways 20", dist. btw.
centers 21'.

● MISCELLANEOUS

1—Sleeper & Hartley No. 3 Univ. Coiler
Clutch Type, wire range No. 12 feed from
6" to 50' of wire, coil range 3/4" to 3 1/2"
inside diam., weight approx. 3100 lbs.

1—Sleeper & Hartley No. 2 1/2 Univ. Coiler
Clutch Type, wire range No. 16 feed from
6" to 60' of wire, coil range 1/4" to 2 1/4"
inside diam., output of 100' of wire per
min., approx. weight 2200 lbs.

3—No. 3A Standard Rotary Swag. Machine,
capacity 2 1/2", latest type.

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USE THIS COUPON

BOTWINIK BROTHERS OF MASS., INC., 14 Sherman St., Worcester 1, Mass.

WE WOULD BE PLEASED TO RECEIVE A COPY OF YOUR CURRENT CATALOG.

NAME.....

ADDRESS.....

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Let's eliminate them by designing every
part for the most suitable material and
applying up-to-date production tools and
methods.

Production-Engineering, Garnet Lake,
N. Y., Tel. North-Creek 41 F 22, is able
to give a complete and objective engineer-
ing service for parts to be made in either
Metal-stamping, Die-casting or Plastic.

All service is done confidential and
either solely or in cooperation with your
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WANTED

SUPERVISOR for factory engaged in manu-
facturing new broaching tools. Must also be
familiar with the servicing of all types of
metal cutting tools. Excellent opportunity
for right man. Chicago area. Box No. 383,
MACHINERY, 148 Lafayette Street, New
York 13, N. Y.

WANTED

TOOL ROOM FOREMAN

Must have 15 to 20 years practical ex-
perience in the manufacture and main-
tenance of jigs, fixtures and tools for
precision mass production. Must be quali-
fied to supervise approximately 40 tool
makers, and analyze equipment troubles.
Excellent opportunity with a well estab-
lished progressive plant, located in East-
ern Pennsylvania. Write fully, giving age,
details of experience and salary expected.
Box No. 388, MACHINERY, 148 Lafayette
Street, New York 13, N. Y.

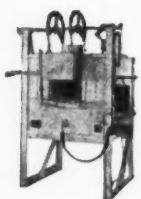
WANTED

OPPORTUNITY for a Mechanical Engineer
with manufacturing and mechanical-produc-
tion experience. Large manufacturer in
smaller eastern Pennsylvania city. Write,
giving age, experience, etc., to Box No. 389,
MACHINERY, 148 Lafayette Street, New
York 13, N. Y.

1926 — pioneered the first practical controlled-atmosphere furnace
"Certain Curtain" ELECTRIC FURNACES
 TODAY — providing the most advanced types of controlled atmosphere furnaces

*If you heat treat in
 controlled atmospheres
 you want this book*

FULLY ILLUSTRATED DATA BOOK
 OF ATMOSPHERE HEAT TREATING
 AND CATALOG NO. 108



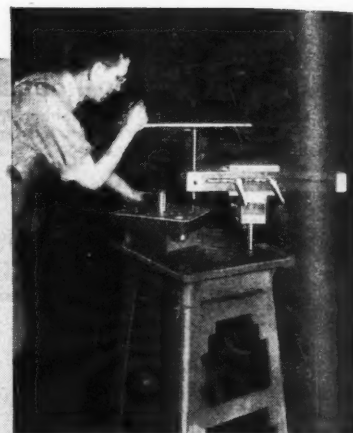
Having pioneered the first practical controlled-atmosphere furnace in 1926, "Certain Curtain" offers today 27 types applying the most advanced atmosphere control methods to hardening, copper brazing, annealing, sintering, tool tip brazing, etc. "The finest atmosphere control costs the lowest!"

C.I. HAYES, INC., 163 BAKER STREET
 PROVIDENCE, R. I.
 Estab. 1905

Write for "CATALOG NO. 108"

PRODUCTO HAND TAPPERS

The one machine needed in every tool, die and machine shop. Will save its cost many times over. Designed for toolroom work to close limits. Built to withstand hard shop use. Quickly adjustable to position taps at any place on table. Now made in 3 sizes... 2 bench types, capacities $\frac{1}{4}$ " and $\frac{1}{2}$ " taps; and Universal Pedestal type, capacity 1" taps. Once in your shop, you will never be without it. Write for descriptive bulletin.



THE PRODUCTO MACHINE CO.

Bridgeport 1, 990 Housatonic Ave. • Bridgeport 4-9481

PRODUCTO SERVICE IS ALWAYS AT THE PHONE ON YOUR DESK



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WANTED—ROLL GRINDER

Used, traveling table type roll grinder to grind rolls 32" x 168" complete with crowning attachment. W. A. Abel, Purchasing Dept., Armstrong Cork Company, Lancaster, Pa.

Need Motor Generator Set

Synchronous Motor 300 H.P. or more, AC, 220 V., 50 Cycles, 3 Phase, 1000 RPM preferred—and Generator 300 H.P., DC, 230 V., 1000 RPM. Will buy the set, or either item separately. Box No. 390, MACHINERY, 148 Lafayette Street, New York 13, N. Y.

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**Supervisor Foreman
 for Gear-Cutting Dept.**

For the man who can qualify, here is an opportunity to make a permanent connection with a large, established firm (plant in Philadelphia suburb). Should be capable of making necessary calculations for gear changes required on various machines in order to produce, to drawing specifications, gears of all types. Write a letter giving your previous experience, education, statement of availability, and references to: Box No. 392, MACHINERY, 148 Lafayette Street, New York 13, N. Y.

FOR SALE

**U.S. TOOL PRODUCTION MILLING MACHINES
 — MODEL MM-160**

motor driven, complete with preloaders, excellent condition, less than two years service, price very reasonable. Write Box No. 376, MACHINERY, 148 Lafayette Street, New York 13, N. Y.

WANTED

Excellent opportunities for an industrial engineer with several years practical experience in engineering shops and maintenance work. Large manufacturer in small eastern Pennsylvania city. Give details about yourself, your experience, etc., in a letter to Box No. 391, MACHINERY, 148 Lafayette Street, New York 13, N. Y.

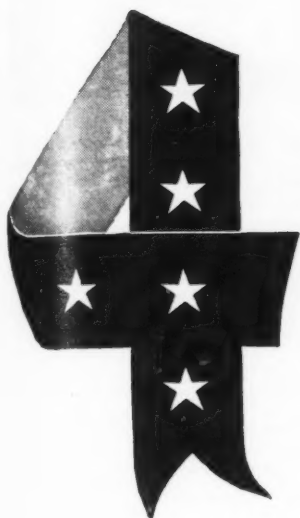
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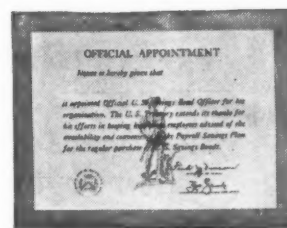
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A booklet for employees . . . explaining graphically how the payroll savings plan works . . . goals to save for, and how to reach them with Saving Bonds.

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The person appointed Official U. S. Savings Bond Officer for his organization is entitled to display this two-color certificate of identification and the Treasury's appreciation of his service.



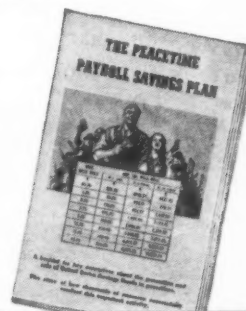
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A red-white-and-blue certificate of commendation by the U. S. Treasury for every company operating the payroll savings plan. You can display it proudly, and it will remind people of the importance of the program.

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A booklet, published for key executives by the Treasury Department, containing helpful suggestions on the conduct of your payroll savings plan for U.S. Savings Bonds.



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If you're not already using these helps to a healthy future, get in touch with your State Director of the Treasury Department Savings Bonds Division. And by all means keep up your payroll savings plan. It's a powerful weapon for the maintenance of a strong, secure economy—today and tomorrow!

The Treasury Department acknowledges with appreciation the publication of this message by

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For addresses of manufacturers listed, consult advertisements in this and previous issue. Index Pages 429-430

ABRASIVE CLOTH AND PAPER

Carborundum Co.
Walls Sales Corp.

ABRASIVE DISCS

See Discs, Abrasive.

ABRASIVES, POLISHING

Carborundum Co.
Norton Co.

ACCUMULATORS, Hydraulic

Baldwin-Southwark Corp.
Bethlehem Steel Co.
Elmes Engineering Works
Farquhar, A. B., Co.
Farrel-Birmingham Co., Inc.
Hydropress Co., Inc.

Lake Erie Engineering Corp.
Morgan Engineering Co.
Watson-Stillman Co.

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders.
Pneumatic; Drills, Portable
Pneumatic, etc.

ALLOYS FOR DIES

National Lead Co.

ALLOY-STEELS

Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Carnegie-Illinois Steel Corp.,
(U. S. Steel Corp. Div.)
Carpenter Steel Co.

Crucible Steel Co. of America
Firth-Sterling Steel Co.
Frasse, Peter A., & Co., Inc.
Ingersoll Steel Div., Borg. Warner Corp.
Republic Steel Corp.,

(Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.
Vanadium Alloys Steel Co.
Wheelock, Lovejoy & Co., Inc.

ALLOYS, ALUMINUM

Aluminum Co. of America

ALLOYS, MAGNESIUM

Dow Chemical Co.

ALLOYS, NON-FERROUS

American Brass Co.

ARBOR PRESSES

See Presses, Arbor.

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Cleveland Twist Drill Co.
Danly Machine Specialties, Inc.
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Jacobs Mfg. Co.
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Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.

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Besly, Chas. H., & Co.
Bunting Brass & Bronze Co.
Cramp Brass & Iron Fdms. Div.
Johnson Bronze Co.
Ryerson, Joseph T., & Son, Inc.

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Gisholt Machine Co.
Ideal Industries, Inc.
Norton Co.
Pope Machinery Corp.
Sunstrand Mch. Tool Co.
Taylor Mfg. Co.

BALLS, Brass, Steel, Etc.

Gwilliam Co.
S K F Industries, Inc.

BARBS, Boring

See Boring Bars.

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Bunting Brass & Bronze Co.
Johnson Bronze Co.

Steel
Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Carpenter Steel Co.
Crucible Steel Co. of America
Firth-Sterling Steel Co.
Frasse, Peter A., & Co., Inc.
Jones & Laughlin Steel Corp.
Republic Steel Corp.
(Union Drawn Steel Div.)
Rustless Iron & Steel Div.,
American Rolling Mills Co.
Ryerson, Joseph T., & Son, Inc.
Timken Roller Bearing Co.
Wheelock, Lovejoy & Co.

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Mahon, R. C., Co.

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Hill Acme Co.
Johnson Bronze Co.

Ball
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Ball & Roller Bearing Co.
Bantam Bearings Div.
Bearings Co. of America
Boston Gear Works, Inc.
Equitable Bearing Co., Inc.
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Hyatt Bearings Div.,
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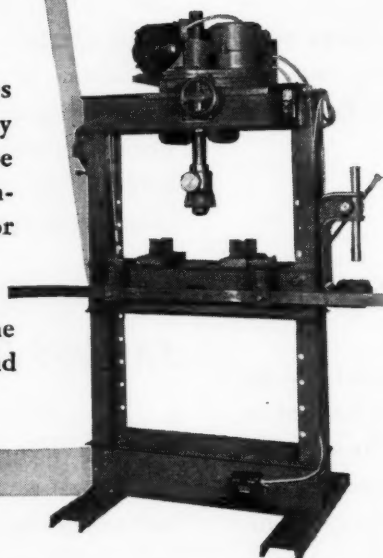
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Roller
Bantam Bearings Div.
Equitable Bearing Co., Inc.
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Rollway Bearing Co., Inc.
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Save Time.. Save Labor

WITH LEMPCO PRESSUREMATIC PRESSES

Lempco Pressurematic Presses will pay for themselves many times in your shop. They can be used for press fitting, assembling, bending, straightening or die tryouts. Pressurematic Presses are made in Electric and Hydraulic models. Pick the one that fits your needs and place your order today.

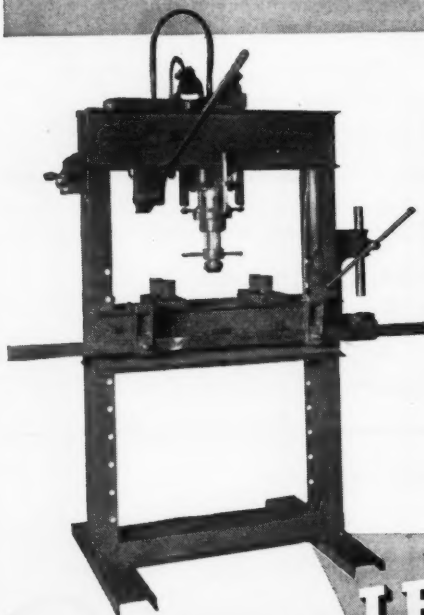


LEMPCO ELECTRIC PRESS

Speed . . . power . . . economy . . . make the Lempco Electric Press the outstanding machine of its kind. Available in 20, 40 and 60 ton models. Foot controls free operator's hands for any operation. Builds up from zero to 60 tons in just 4 seconds. Automatic Pressure Control available for this press. Prevents excessive pressure which might damage work. And it also permits press to be used for production runs.

LEMPCO HYDRAULIC PRESS

Two pumping speeds . . . adjustable work head on 60-ton model for easy centering over work . . . long ram travel . . . and other fine features make the Lempco Hydraulic Press the most efficient hand-operated press on the market. Made in 40 and 60 ton models.



5762 DUNHAM ROAD
BEDFORD, OHIO

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Write for free book
that tells how, when
and where Lempco
Pressurematic Presses
can be used to
your greatest advantage.

Self-Lubricating (Oilless)

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Spherical

Heim Co.

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Kaydon Engineering Corp.
Raybestos-Manhattan, Inc.
Manhattan-Rubber Div.
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Timken Roller Bearing Co.

Thrust

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Ball & Roller Bearing Co.
Bantam Bearings Div.
Bearings Co. of America
Boston Gear Works, Inc.
Bunting Brass & Bronze Co.
General Electric Co.
Gwilliam Co.
Kaydon Engineering Corp.
McGill Manufacturing Co.
Norma-Hoffmann Bearings Corp.
Orange Roller Bearing Co., Inc.
Timken Roller Bearing Co.

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Bristol Co.
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Manhattan-Rubber Div.

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Hill Acme Co.
Standard Pressed Steel Co.

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Bethlehem Steel Co.
Buffalo Forge Co.
Farquhar, A. B., Co.
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
Lake Erie Engineering Corp.
Morgan Engineering Co.
Watson-Stillman Co.

Pipe

Buffalo Forge Co.
Farquhar, A. B., Co.
Hydraulic Press Mfg. Co.
Watson-Stillman Co.

BLAST CLEANING EQUIPMENT

Pangborn Corp.
Production Machine Co.
Walls Sales Corp.

BLOWERS

Buffalo Forge Co.
Candy-Otto Mfg. Co.
Ideal Industries, Inc.
De-Laval Steam Turbine Co.
Ingersoll-Rand Co.
Westinghouse Electric Corp.

BOILER TUBES

Ajax Manufacturing Co.
Bethlehem Steel Co.
Jones & Laughlin Steel Corp.
National Tube Co.
(U. S. Steel Corp., Div.)
Ryerson, Joseph T., & Son, Inc.
Timken Roller Bearing Co.

BOLT AND NUT MACHINERY

Ajax Manufacturing Co.
Denbow Engineering Co.
Hill Acme Co.
Laudie Mch. Co.
Modern Tool Works
National Machinery Co.
New Britain-Griffith Mch. Div.,
New Britain Machine Co.
Oster Manufacturing Co.

BOLTS AND NUTS

Aluminum Co. of America
Bethlehem Steel Co.
Elastic Stop Nut Corp. of America
National Acme Co.
Pawtucket Mfg. Co.
Republic Steel Corp.,
(Union Drawn Steel Div.)

BOOKS, Technical

Industrial Press
Lincoln Electric Co.

**BORING AND DRILLING
MACHINES, Vertical**

Baker Brothers, Inc.
Barney Drill Co.
Barney, W. F., & John, Co.
Bullard Company
Consolidated Mch. Tool Corp.
Cosa Corp.
Foot-Burt Co.
Gorton, George, Mch. Co.



BUILT FOR TOUGH JOBS!

- The invisible strength of this mighty giant lifts and places heavy loads at your command.

The rugged construction of Shepard Niles Single Beam Cranes assures added handling economy resulting in extra value in terms of production economy. Shepard Niles Cranes are made tough and durable to give long, dependable service. They are made in many types, capacities and spans to fit your particular need.



To meet competitive production schedules—to maintain smooth-flowing production lines, material handling equipment must stand up under severe operating conditions. You'll get capacity load-handling, long efficient service at low maintenance cost with a Shepard Niles Hoist.

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CRANE & HOIST CORPORATION

Improve your competitive position in the industrial world. A request will bring you full data and tell you how you can put a Shepard Niles Crane to efficient use in your factory.

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MACHINERY, September, 1946—411

Ingersoll Milling Mch. Co.
Jones Machine Tool Wks., Inc.
Moline Tool Co.
National Acme Co.
National Automatic Tool Co.
Pedrick Tool & Mch. Co.
Rogers Machine Works, Inc.
Sellers, Wm., & Co., Inc.

BORING AND TURNING MILLS, Vertical

Bullard Company
Cincinnati Planer Co.
Cosa Corp.
Jones Machine & Tool Works, Inc.
Rogers Machine Works, Inc.
Sellers, Wm., & Co., Inc.

BORING BARS

Armstrong Bros. Tool Co.
Bullard Company
Carboloy Co., Inc.
Ex-Cell-O Corp.
Firth-Sterling Steel Co.

Gairing Tool Co.
Gisholt Machine Co.
McCroskey Tool Corp.
Ready Tool Co.
Scully-Jones Co.
Warner & Swasey Co.
Williams, J. H., & Co.

BORING, DRILLING AND MILLING MACHINES, Horizontal

Barnes, W. F., & John, Co.
Cross Co.
Firth-Sterling Steel Co.
Giddings & Lewis Mch. Tool Co.
Ingersoll Milling Mch. Co.
Jones Machine Tool Wks., Inc.
Lucas Mch. Tool Co.
Moline Tool Co.
National Automatic Tool Co.
Ohio Machine Tool Co.
Sellers, Wm., & Co., Inc.
Sommer & Adams Co.
Universal Boring Machine Co.

BORING HEADS

Criterion Machine Works
Ex-Cell-O Corp.
Gairing Tool Co.
McCroskey Tool Corp.

BORING HEADS, Offset

Gairing Tool Co.

BORING MACHINES, Diamond and Carbide Tool

Ex-Cell-O Corp.
Heald Machine Co.
National Automatic Tool Co.
Stokerunit Corp.

BORING MACHINES, Jig

Cincinnati Bickford Tool Co.
Fosdick Machine Tool Co.
Kearney & Trecker Products Corp.
Machinery Mfg. Co.
Moore Special Tool Co., Inc.
Pratt & Whitney Co.

Reed-Prentice Corp.
Triplex Machine Tool Corp.

BORING TOOLS

Armstrong Brothers Tool Co.
Carboloy Co., Inc.
Ex-Cell-O Corp.
Firth-Sterling Steel Co.
Gairing Tool Co.
Gisholt Mch. Co.
Haynes Stellite Co.
Jones & Lamson Mch. Co.
Kennametal, Inc.
McCroskey Tool Corp.
Morse Twist Drill & Mch. Co.
Ready Tool Co.
Scully-Jones & Co.
Slocumb, J. T., Co.
Union Twist Drill Co.
Warner & Swasey Co.
Williams, J. H., & Co.

BRAKES, Press and Bending

Bliss, E. W., Co.
Cincinnati Shaper Co.
O'Neil-Irwin Mfg. Co.
Peck, Stow & Wilcox Co.
Steelweld Mchry. Div. of Cleveland
Crane & Engrg. Co.
Verson Allsteel Press Co.
Warren City Mfg. Co.
Watson-Stillman Co.

BROACHES

American Broach & Mch. Co.
Carboloy Co., Inc.
Colonial Broach Co.
Detroit Broach Co.
Ex-Cell-O Corp.
Lapointe Machine Tool Co.
National Broach & Mch. Co.

BROACHING MACHINES

American Broach & Mch. Co.
Cincinnati Milling Mch. Co.
Colonial Broach Co.
Consolidated Mch. Tool Corp.
Foote-Burt Co.
Lapointe Machine Tool Co.
National Broach & Mch. Co.
Oilgear Co.

BRONZE

American Brass Co.
Ampco Metal, Inc.
Bunting Brass & Bronze Co.
Cramp Brass & Iron Foundries Div.
Delta Manufacturing Co.
Jefferson Machine Tool Co.
Johnson Bronze Co.
Shook Bronze Co.

BUFFERS

Bridgeport Safety Emery Wheel Co., Inc.
Delta Manufacturing Co.
Gardner Machine Co.
Production Machine Co.
Rotor Tool Co.

BULLDOZERS

Ajax Manufacturing Co.
Baldwin-Southwark Corp.
Hannifin Mfg. Co.
Lake Erie Engineering Corp.
Watson-Stillman Co.

BURNISHING MACHINERY

Baird Machine Co.

BUSHINGS, Brass, Bronze, Etc.

Ampco Metal, Inc.
Boston Gear Works, Inc.
Bunting Brass & Bronze Co.
Haynes Stellite Co.
Johnson Bronze Co.

Hardened

Baumbach, E. A., Mfg. Co.
Danly Machine Specialties, Inc.
Leland-Gifford Co.
U. S. Steel Co., Inc.

Jig

Ampco Metal, Inc.
Colonial Broach Co.
Ex-Cell-O Corp.
Universal Engineering Co.

CABINETS, Tool

Armstrong Brothers Tool Co.

CALIPERS

American Measuring Instruments Corp.
Brown & Sharpe Mfg. Co.
Scherr, George, Co., Inc.
Starrett, L. S., Co.

CAM CUTTING MACHINES

Frew Machine Co.
Pratt & Whitney Co.

CAM MILLING AND GRINDING MACHINES

Rowbottom Machine Co.

CAMS

Hartford Special Mchry. Co.
Kux Machine Co.
Rowbottom Machine Co.
Venco Corporation

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

Allegheny Ludlum Steel Corp.
Carboloy Co., Inc.
Firth-Sterling Steel Co.
Kennametal, Inc.
Metal Carbides Corp.
Vanadium Alloys Steel Co.

CASE-HARDENING

Pittsburgh Gear & Machine Co.

HEAT TREAT SMALL PARTS

In Your Own Plant

ESSENTIAL FOR TOOL AND DIE SHOPS

You save time and money heat treating small tools and dies in a Cooley Electric Furnace. Uniform temperatures are maintained throughout the furnace chamber to assure even heating of parts. The heating elements are embedded in refractory materials, protecting against atmospheric attack. They are easily replaceable.

ECONOMICAL TO OPERATE

To hold 1600° F. in the MH-3 furnace requires less than 2 kw. At power rate of 2c per kw.-hr., operating cost is under 4c per hour. The MH-4 furnace requires less than 2.5 kw. or under 5c per hour at the same rate. Cooley Furnaces are easily installed—ready for immediate service by connecting power lines to two terminals. Quiet in operation—no fumes or odors—no ventilating necessary—they can be located at any convenient place in the shop.



More Profitable Reasons for Using Cooley Furnaces

- 1—Hardening, drawing and tempering small batches in large furnaces is uneconomical.
- 2—Small parts can be normalized and annealed quickly and easily.
- 3—Convenient for pre-heating prior to high-speed hardening.
- 4—Always available to handle emergency repair work without delay.
- 5—Use as a pilot furnace to pre-determine techniques for production heat treating.

TWO NEW OPTIONAL FEATURES AVAILABLE

1. **Vertical Lift Door**—Counter weighted for ease of operation—conserves heat where door need not be fully opened to enter or remove work. Supplied in place of standard hinged hearth door at \$20.00 additional to regular furnace prices shown below.



2. **Heavy Gauge Steel Stand**—For ease of installation and operation—locates furnace at most convenient operating height and provides additional working and storage space. Add \$35.00 to regular furnace prices shown below.

AVAILABLE IN TWO SIZES

Type	Chamber Capacity	Amps 115 V	Watts	Amps 230 V	Price
MH-3	8"W 6"H 14"L	29.6	3400	14.8	\$146.00*
MH-4	10"W 6"H 18"L	4800	20.9	\$222.50*

*Includes Hearth Plate

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.
AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire—approximately \$150.00.

NO SALESMEN WILL CALL

Ask for free information and ordering instructions so you can make your own decision and determine your own requirements. Write for Bulletin No. 50 today—no obligation.



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INDIANAPOLIS MACHINERY EXPORT CORP.

Export Manager, 44 Whitehall Street, New York, New York

Williams, J. H., & Co.

CASE-HARDENING FURNACES
See Furnaces, Heat Treating.

CASTINGS

Aluminum, Brass, Bronze, Magnesium,
Etc.

Aluminum Co. of America
Ampco Metal, Inc.
Bethlehem Steel Co.
(Brass and Bronze only)
Bunting Brass & Bronze Co.
Cramp Brass & Iron Foundries Div.

Die

Aluminum Co. of America
American Brass Co.
Madison-Kipp Corporation
Veeder-Root, Inc.

Gray Iron

Bethlehem Steel Co.
Brown & Sharpe Mfg. Co.
Union Mfg. Co.

Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp.
American Brake Shoe Co.
Bethlehem Steel Co.
Birdsboro Steel Fdry. & Mch. Co.
Cramp Brass & Iron Foundries Div.
Lebanon Steel Foundry.

CEMENT, Disc Grinding Wheel

Besly, Chas. H., & Co.
Carborundum Co.
Gardner Machine Co.
Hendey Machine Co.
Walls Sales Corp.

CENTERING MACHINES

Consolidated Mch. Tool Corp.
Cross Co.
Hanson-Whitney Machine Co.
Jones & Lamson Mch. Co.
Pratt & Whitney Co.

CENTERS

Lathe

Carboloy Co., Inc.
Firth-Sterling Steel Co.
Ideal Industries, Inc.
Kennametal, Inc.
Morse Twist Drill & Mch. Co.
Scully-Jones & Co.
Standard Tool Co.

Planer & Miller

Cincinnati Planer Co.

CHAIN DRIVES

Morse Chain Co.

**CHAINS, Power Transmission and
Conveyor**

Boston Gear Works, Inc.
Philadelphia Gear Works

**CHAMFERING MACHINES,
Gear Tooth**

Bilgram Gear & Mch. Works
Consolidated Mch. Tool Corp.
Cross Co.
Grant Mfg. & Mch. Co.
Lipe-Rollway Corp.

CHARTS, MEASUREMENT

Capell Engrg. Co.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co.

CHUCKING MACHINES

Baird Machine Co.
Bardons & Oliver, Inc.
Bliss, E. W., Co.
Bullard Company
Cleveland Automatic Machine Co.
Gisholt Machine Co.
Goss & DeLeeuw Mch. Co.
Heald Machine Co.
Jones & Lamson Machine Co.
National Acme Co.
New Britain-Gridley Mch. Div.
Potter & Johnston Mch. Co.
Sundstrand Mch. Tool Co.
Warner & Swasey Co.

Multiple Spindle

Goss & DeLeeuw Mch. Co.
National Acme Co.
New Britain-Gridley Mch. Div.

CHUCKS

Air Operated

Hannifin Mfg. Co.
Logansport Machine Co., Inc.
Schader's Son, A.
Skinner Chuck Co.
Union Mfg. Co.

Collet or Split

See Collets.

Diaphragm

Van Norman Co.

Drill

Cleveland Twist Drill Co.
Etco Tool Co.
Jacobs Mfg. Co.
McCroskey Tool Corp.
Modern Tool Works
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Proconier Safety Chuck Co.
Scully-Jones & Co.
Skinner Chuck Co.
Standard Tool Co.
Taylor Mfg. Co.
Union Mfg. Co.

Full Floating

Errington Mechanical Laboratory
Gisholt Mch. Co.
Scully-Jones & Co.

Difficult Centrifugal Castings regularly produced at

Ampco

... Years of experience and specialized "know-how" back up this exceptional casting service

An inside flange is not easy to cast by the centrifugal method. Ampco did it successfully — turning out 100% sound castings.

Ampco's experience with centrifugal castings goes back over 20 years. The Ampco organization pioneered the use of this method with aluminum bronze and other copper-base alloys. Procedures have been tested and proved by years of research. The machines themselves have been specially designed by Ampco engineers.

This ability to cast centrifugally is important to you on many applications, because the centrifugal method offers significant advantages: (1) A sounder, more compact grain structure, with better strength and uniform physical properties. (2) Less waste material than with sand casting; defective material is practically eliminated. (3) Castings closer to finish size, saving metal and machining time.

Centrifugal casting is just one of the many diversified production facilities which make Ampco a complete, self-contained source for copper-base alloy parts. A competent field engineer will be happy to help you with your own particular problem. Write for bulletin.

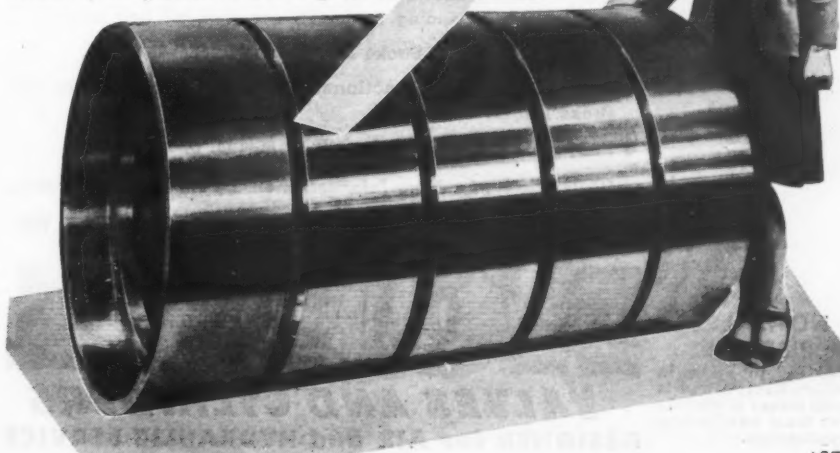


Ampco Metal, Inc.

Dept. M-9, Milwaukee 4, Wisconsin

Centrifugally Cast Brake Drums of Ampco Beryllium-Copper Stop a 1500 h.p. Diesel Engine in 7 Seconds

Here is a tough job that demonstrates the exceptional wear-resistance of Ampcolloys. Note the size of these drums by comparison with the figure in the illustration.



A-37

Lathe, Etc.
Bullard Company
Cushman Chuck Co.
Gisholt Mch. Co.
Jones & Lamson Mch. Co.
Rivett Lathe & Grinder, Inc.
Scherr, George, Co., Inc.
Skinner Chuck Co.
Union Mfg. Co.
Warner & Swasey Co.

Magnetic
Arter Grinding Machine Co.
Brown & Sharpe Mfg. Co.
Hanchett Mfg. Co.
Taft-Peire Mfg. Co.
Walker, O. S., Co., Inc.

Quick Change and Safety
Errington Mechanical Laboratory
McCrosky Tool Corp.
Modern Tool Works
Procunier Safety Chuck Co.
Scully-Jones & Co.

Ring Wheel
Bridgeport Safety Emery Wheel Co., Inc.

Gardner Machine Co.
Tapping
Barber-Colman Co.
Errington Mechanical Laboratory
Greenfield Tap & Die Corp.
Jacobs Mfg. Co.
McCrosky Tool Corp.
Procunier Safety Chuck Co.
Scully-Jones & Co.
Skinner Chuck Co.

CIRCUIT BREAKERS
General Electric Co.
Westinghouse Electric Corp.

CLAMPS
Armstrong Brothers Tool Co.
Baumbach, E. A., Mfg. Co.
Besly, Chas. H., & Co.
Brown & Sharpe Mfg. Co.
Dandy Machine Specialties, Inc.
Meal Specialties Co.
Starrett, L. S., Co.
Williams, J. H., & Co.

CLEANERS, Chemical, for Metal
Bullard Co., Bullard-Dunn Process Div.

Oakite Products, Inc.
CLUTCHES
Barnes Drill Co.
Clearing Mch. Corp.
Farrell-Birmingham Co., Inc.
Foote Bros. Gear & Machine Corp.
Hilliard Corp.
Johnson, Carlyle, Machine Co.
Lipe-Rollway Corp.
Morse Chain Co.
Rockford Clutch Div.
Twin Disc Clutch Co.

COATINGS, PROTECTIVE
Bakelite Corp.
Bullard Co., Bullard-Dunn Process Div.

COLLARS, Safety
Standard Pressed Steel Co.
Spacings, Etc.

Scully-Jones & Co.
COLLETS
Ames, B. C., Co.
Brown & Sharpe Mfg. Co.
Cleveland Twist Drill Co.

Gisholt Mch. Co.
Hannifin Mfg. Co.
Hardinge Brothers, Inc.
Jones & Lamson Mch. Co.
Modern Tool Wks.
New Britain-Gridley Mch. Div.,
New Britain Machine Co.
Pratt & Whitney Co.
Rivett Lathe & Grinder, Inc.
Scully-Jones & Co.
Standard Tool Co.
Stark Tool Co.
Union Twist Drill Co.
Universal Engineering Co.
Wade Tool Co.
Warner & Swasey Co.

COMPARATORS—
See Gages, Comparator.
COMPARATORS, Screw Thread

Jones & Lamson Mch. Co.
Scherr, George, Co., Inc.
Triplex Machine Tool Corp.

COMPOUNDS

Cleaning

Oakite Products, Inc.
Cutting, Grinding, Metal Drawing, Etc.
Cities Service Oil Co.
Gulf Oil Corp.
National Broach & Mch. Co.
(Broaching and Lapping)
Oakite Products, Inc.
Shell Oil Co., Inc.
Standard Oil Co., (Indiana)
Stuart, D. A., Oil Co., Ltd.
Sun Oil Co.
Texas Co.
Tide Water Associated Oil Co.
United States Products Co. (Lapping)
Resin or Molding

Bakelite Corp.
Durez Plastics & Chemicals, Inc.
General Electric Co.

COMPRESSORS, Air

DeLaval Steam Turbine Co.
Ingersoll-Rand Co.

CONTRACT WORK

Acc Manufacturing Corp.
Adams Stamping Co.
American Measuring Instruments Corp.
Bliss, E. W., Co.
Columbus Die, Tool & Mch. Co.
Dieffendorf Gear Corp.
Ex-Cell-O Corp.
Hartford Special Mchry. Co.
Hill Acme Co.
Jack & Heintz Precision Industries, Inc.
Kaydon Engrg. Corp.
Langelier Mfg. Co.
LeBlond, R. K., Mch. Tool Co.
Mummet-Dixon Co.
National Acme Co.
Rockford Machine Tool Co.
Taft-Peire Mfg. Co.
U. S. Tool Co., Inc.
Wade Tool Co.

CONTROLLERS

Allen-Bradley Co.
Bristol Co.
Clark Controller Co.
General Electric Co.
Westinghouse Electric Corp.

COUNTERBORES

Carboloy Co., Inc.
Cleveland Twist Drill Co.
Continental Tool Works Div.
Ex-Cell-O Corporation
Firth-Sterling Steel Co.
Gairing Tool Co.
Genesee Tool Co.
Haynes Stellite Co.
Kenametal, Inc.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Starrett, L. S., Co.
Union Twist Drill Co.

COUNTERSHAFTS

LeBlond, R. K., Mch. Tool Co.
Standard Pressed Steel Co.
Warner & Swasey Co.

COUNTERSINKS

Ex-Cell-O Corp.
Gairing Tool Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.

COUNTERS, Revolution

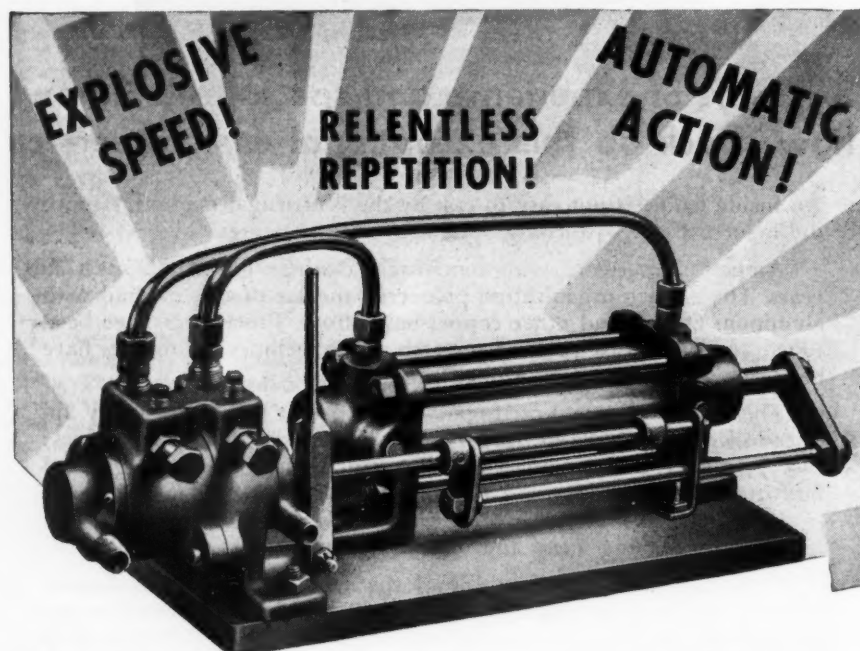
Bristol Co.
Brown & Sharpe Mfg. Co.
Starrett, L. S., Co.
Veeder-Root, Inc.

COUNTING DEVICES

Starrett, L. S., Co.
Veeder-Root, Inc.

COUPLINGS

Flexible
Atlantic Gear Works, Inc.
Houston Gear Works, Inc.
Eberhardt-Denver Co.
Farrell-Birmingham Co., Inc.
Foote Bros. Gear & Machine Corp.
Lovejoy Flexible Coupling Co.
Morse Chain Co.



NOPAK Reciprotrol Valve

Provides All Three — in Full Measure!

This radically new, 4-way, automatic reciprocating valve features Built-in Controls which provide the following advantages in operating any size or make of air or hydraulic cylinder, at 50 to 300 lb. line pressure:—

- Built-In Speed Control regulates stroke-speed in both directions, independently; allows choice of cycle speeds from 0 to 500 per minute . . . depending upon cylinder diameter and length.
- Accurate Control of Stroke Length from fractional to full.
- Precise Location of Fractional Stroke anywhere within full stroke length.
- Fully-Automatic, Semi-Automatic or Manual operation.

Write, Today, for More Information on the Amazing Reciprotrol.

GALLAND-HENNING MFG. CO., 2775 S. 31st ST., MILWAUKEE 7, WIS.

NOPAK
VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

NOW IN 3/4" PIPE SIZE!

The 3/4" pipe size in which Reciprotrol is built makes it suitable for most oscillating applications.

A 5022-1/2 I-R

Philadelphia Gear Works

Pipe, Tubes, Etc.
Dart, E. M., Mfg. Co.

Shaft

Boston Gear Works, Inc.
Foote Bros. Gear & Machine Corp.
Hillard Corp.
Sellers, Wm., & Co., Inc.
Standard Pressed Steel Co.

CRANES, Electric Traveling

Morgan Engineering Co.
Shepard Niles Crane & Hoist Corp.

Hand Traveling

Shepard Niles Crane & Hoist Corp.

Locomotives

Cullen-Friedstedt Co.

Hill Acme Co.

Portable

Canedy-Otto Mfg. Co.

CUTTER GRINDERS

See Grinding Machines, Universal, for
Sharpening Cutters, Reamers,
Hobs, Etc.

CUTTERS, Gear

Brown & Sharpe Mfg. Co.
Ex-Cell-O Corp.
Fellows Gear Shaper Co.
Michigan Tool Co.
Morse Twist Drill & Mch. Co.
National Broach & Mch. Co.
(Gear Shaper)
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Standard Tool Co.
Union Twist Drill Co.
Waltham Mch. Wks.

Milling

Barber-Colman Co.
Brown & Sharpe Mfg. Co.
Carbonyl Co., Inc.
Columbus Die, Tool & Machine Co.
Continental Tool Works Div.
Detroit Tap & Tool Co.
Ex-Cell-O Corp.
Firth-Sterling Steel Co.
Gairing Tool Co.
Gammone-Hosagund Co.
Genesee Tool Co.
Gorton, George, Mch. Co.
Haynes Stellite Co.
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Kennametal, Inc.
McDrosky Tool Corp.
Modern Tool Wks.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Nelco Tool Co.
Pratt & Whitney Co.
Producto Machine Co.
Reed-Prentice Corp.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

CUTTING-OFF MACHINES

Avey Drilling Machine Co.
Bardone & Oliver, Inc.
Bridgeport Safety Emery Wheel Co., Inc.
Brown & Sharpe Mfg. Co.
Consolidated Mch. Tool Corp.
Landis Machine Co.

Abrasive Wheel

Armstrong Brothers Tool Co.
Bridgeport Safety Emery Wheel Co., Inc.
Campbell, Andrew C., Div. American
Chain & Cable Co., Inc.
Delta Manufacturing Co.

Cold Saw

See Sawing Machines, Circular.

CUTTING-OFF TOOLS

Armstrong Brothers Tool Co.
Empire Tool Co.
Firth-Sterling Steel Co.
Haynes Stellite Co.
Luera, J. Milton
Pratt & Whitney Co.
Williams, J. H., & Co.

CUTTING-OFF WHEELS, Abrasive

Bay State Abrasive Co.
Carborundum Co.
Norton Co.
Raybestos-Manhattan, Inc.,
Manhattan-Rubber Div.

CYLINDER BORING MACHINES

Baker Brothers, Inc.
Barnes Drill Co.
Consolidated Mch. Tool Corp.
Cress Co.
Ex-Cell-O Corp.
Ingersoll Milling Mch. Co.
Moline Tool Co.
Sellers, Wm., & Co., Inc.

CYLINDERS, Hydraulic

American Hollow Boring Co.
Barnes, John S., Corp.
Clearing Mch. Corp.
Deussen-Engineering Co.
Galland-Henning Mfg. Co.
Hanna Engrg. Works
Hannibal Mfg. Co.
Hydraulic Press Mfg. Co.



Fundamental... to good gear cutting



TOUGH STEELS, deep cuts, high finish requirements characterize most gear cutting operations.

Tearing, scuffing and metal pickup are often serious machining problems to makers of gears.

Wise gear manufacturers avoid these difficulties by specifying Stuart's high lubricity, high anti-weld type cutting oils for gear hobbing, shaping, generating, or finishing operations.

Stuart Cutting Oils and Stuart Engineering Service will help you produce better gears at lower cost.



Write for:

"Cutting Fluids for Better Machining"

D.A. Stuart Oil Co.
EST. 1905 LIMITED

2739 SOUTH TROY STREET, CHICAGO 23, ILL.



Stuart Oil Engineering Goes With Every Barrel

Hydraulic Products Co.
Logansport Machine Co., Inc.
Oilgear Co.
Rockford Machine Tool Co.
Skinner Chuck Co.

Pneumatic

Clearing Mch. Corp.
Hanna Engrs. Works
Hannifin Mfg. Co.
Hydraulic Products Co.
Oakland Engineering Co.
Skinner Chuck Co.

DEALERS, Machinery

Bealy, Chas. H., & Co.
Earle Gear & Mch. Co.
Lundén & Bonthron
Ryerson, Joseph T., & Son, Inc.
Simmons Machine Tool Corp.

DEMAGNETIZERS

Blanchard Mch. Co.
Heald Machine Co.
Ideal Industries, Inc.
Walker, O. S., Co., Inc.

DESIGNERS, Machine and Tool

American Tool Engineering Co.
Ex-Cell-O Corp.
Hartford Special Mchry. Co.
Jones, C. K., Inc.
La Salle Engineering Co.
Ruthman Mchry. Co.
Venco Corporation

DIAMONDS and Diamond Tools

Desmond-Stephan Mfg. Co.
Raybestos-Manhattan, Inc.,
Manhattan-Rubber Div.
Smit, J. K., & Co.

DIE CASTING MACHINES

Hydraulic Press Mfg. Co.
Kux Machine Co.
Madison-Kipp Corp.
Reed-Prentice Corp.

DIE CASTING

See Castings, Die.

DIE CUSHIONS, Pneumatic

Bliss, E. W., Co.

Clearing Mch. Corp.
Verson Allsteel Press Co.

DIE INSERTS, Carbide

Carboloy Co., Inc.
Firth-Sterling Steel Co.
Kennametal, Inc.

DIE MAKERS' SUPPLIES

Baumbach, E. A., Mfg. Co.
Danly Mch. Specialties, Inc.
U. S. Tool Company, Inc.

DIE MAKING MACHINES

Grob Brothers
Kearney & Trecker Corp.
Oliver Instrument Co.

DIE SETS, Standard

Baumbach, E. A., Mfg. Co.
Danly Mch. Specialties, Inc.
Pratt & Whitney Co.
Producto Machine Co.

DIE SINKING MACHINES

Cincinnati Milling Mch. Co.

Gorton, George, Mch. Co.
Pratt & Whitney Co.
Reed-Prentice Corp.

DIE SINKING PRESSES

Baldwin-Southwark Corp.
Kearney & Trecker Corp.

DIE STOCKS

See Stocks, Die.

DIES, Lettering and Embossing

Noble & Westbrook Mfg. Co.
Sossner, Inc.

DIES

Sheet Metal, Etc.

Baumbach, E. A., Mfg. Co.
Bliss, E. W., Co.
Columbus Die, Tool & Mch. Co.
Niagara Mch. & Tool Wks.
Peck, Stow & Wilcox Co.
Ruthman Mchry. Co.
Taft-Peirce Mfg. Co.
Verson Allsteel Press Co.
V & O Press Co.
Wade Tool Co.
Waltham Mch. Wks.

Threading

Butterfield Div., Union Twist Drill Co.
Card, S. W., Mfg. Co.
Eastern Mch. Screw Corp.
Geometric Tool Co.
Greenfield Tap & Die Corp.
Hill Acme Co.
Jones & Lamson Mch. Co.
Landis Mch. Co., Inc.
Modern Tool Works
Morse Twist Drill & Mch. Co.
National Acme Co.
Oster Manufacturing Co.
Pratt & Whitney Co.
Standard Tool Co.

Threading Opening

Eastern Mch. Screw Corp.
Errington Mechanical Laboratory
Geometric Tool Co.
Hill Acme Co.
Jones & Lamson Mch. Co.
Landis Mch. Co., Inc.
Modern Tool Works
National Acme Co.
Oster Manufacturing Co.

Thread Rolling

Hanson-Whitney Mch. Co.
Pratt & Whitney Co.
Rolled Thread Die Co.

DISCS, Abrasive

Bealy, Chas. H., & Co.
Carborundum Co.
Gardner Mch. Co.
Norton Co.
Raybestos-Manhattan, Inc.,
Manhattan-Rubber Div.
Simonds Abrasive Co.
Walls Sales Corp.

DIVIDING HEADS

See Index Centers.

DOWEL PINS

Allen Mfg. Co.
Baumbach, E. A., Mfg. Co.
Danly Mch. Specialties, Inc.
U. S. Tool Co., Inc.

DRAFTING MACHINES

Universal Drafting Machine Co.

DRAWING BOARDS AND TABLES

Universal Drafting Machine Co.

DRESSERS, Grinding Wheel

Carboloy Co., Inc.
Desmond-Stephan Mfg. Co.
Hanchett Mfg. Co.
Ideal Industries, Inc.
Norton Co.
Smit, J. K., & Co.
Standard Tool Co.
Venco Corporation

DRIFTS, DRILL

Armstrong Bros. Tool Co.
Standard Tool Co.

DRILL HEADS

Unit Type

Barnes Drill Co.
Rehnberg-Jacobson Mfg. Co.

Multiple

Baker Brothers, Inc.
Barnes Drill Co.
Buffalo Forge Co.
Buhr Machine Tool Co.
Delta Manufacturing Co.
Errington Mechanical Laboratory
Etico Tool Co.
Ex-Cell-O Corp.
Langelier Mfg. Co.
Moline Tool Co.
National Automatic Tool Co.
Thriftmaster Products, Div.,
Thomson Industries, Inc.

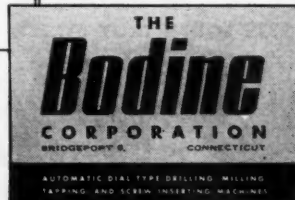
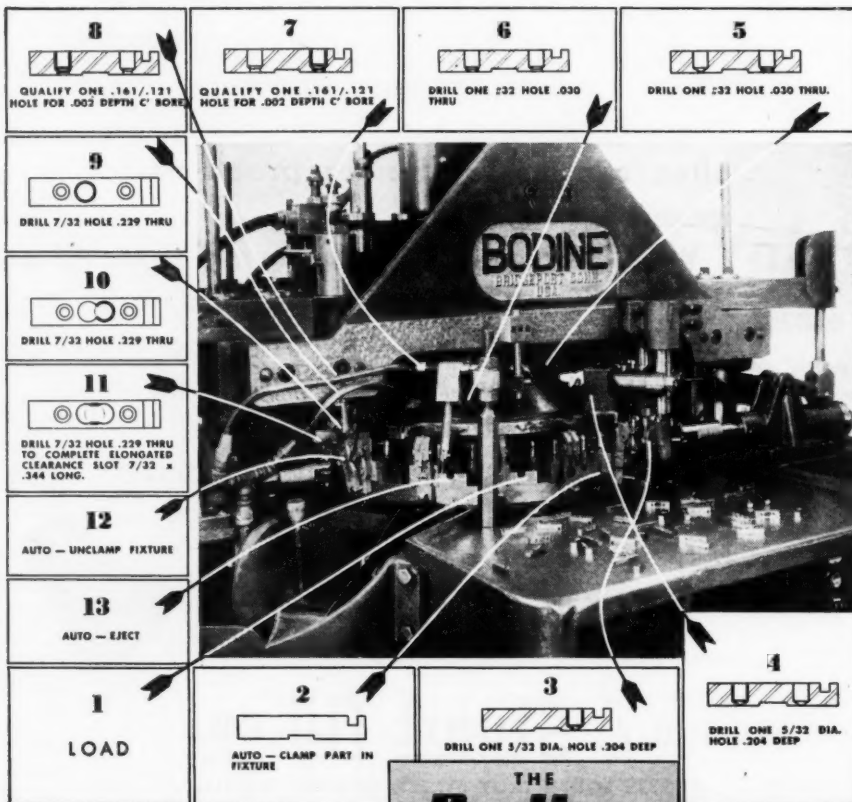
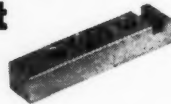
DRILL SOCKETS

Armstrong Bros. Tool Co.
Cleveland Twist Drill Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.

Bodine.. CASE HISTORY No. 18

Processing a Steel Component

PRODUCTION: There are 9 operations automatically performed on this Steel Component, size .229 thick x .289 wide x 1.280 long. Speed: 600 pieces per 50 minute hour.



Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.

DRILL SPEEDERS
Graham Mfg. Co., Inc.

DRILL STANDS
Cleveland Twist Drill Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Standard Tool Co.
Union Twist Drill Co.

DRILLING MACHINES
Automatic
Avey Drilling Machine Co.
Baker Brothers, Inc.
Barnes Drill Co.
Barnes, W. F., & John Co.
Bodine Corp.
Bradford Machine Tool Co.
Buhr Machine Tool Co.
Consolidated Mch. Tool Corp.
Cross Co.
Grant Mfg. & Mch. Co.
Kingsbury Mch. Tool Corp.
Langelier Mfg. Co.
National Automatic Tool Co.

Bench
Ames, B. C. Co.
Atlas Press Co.
Avey Drilling Machine Co.
Buffalo Forge Co.
Canedy-Otto Mfg. Co.
Delta Manufacturing Co.
Dumore Co.
Elgin Tool Wks., Inc.
Fosdick Machine Tool Co.
Henry & Wright Mfg. Co.
Langelier Mfg. Co.
Leland-Gifford Co.
Moline Tool Co.
Production Machine Co.
Taylor Mfg. Co.
Walker-Turner Co., Inc.

Boller
Cincinnati Bickford Tool Co.
Foote-Burt Co.
Sellers, Wm., & Co., Inc.

Gang
Avey Drilling Machine Co.
Baker Brothers, Inc.
Barnes Drill Co.
Canedy-Otto Mfg. Co.
Cincinnati Bickford Tool Co.
Consolidated Mch. Tool Corp.
Cross Co.
Delta Manufacturing Co.
Foote-Burt Co.
Fosdick Machine Tool Co.
Ingersoll Milling Mch. Co.
Langelier Mfg. Co.
Leland-Gifford Co.
Moline Tool Co.
National Automatic Tool Co.
Production Machine Co.
Producto Machine Co.
Sellers, Wm., & Co., Inc.

Horizontal Duplex
Avey Drilling Machine Co.
Baker Brothers, Inc.
Barnes Drill Co.
Barnes, W. F., & John Co.
Bradford Machine Tool Co.
Consolidated Mch. Tool Corp.
Cross Co.
Davis & Thompson Co.
Frew Machine Co.
Kingsbury Mch. Tool Corp.
Langelier Mfg. Co.
National Automatic Tool Co.
Sellers, Wm., & Co., Inc.
Sundstrand Mch. Tool Co.

Inverted
Baker Brothers, Inc.
Barnes Drill Co.

Multiple Center Column Type
Barnes Drill Co.

Multiple Spindle
Avey Drilling Machine Co.
Baker Brothers, Inc.
Barnes Drill Co.
Barnes, W. F., & John Co.
Baugh Machine Tool Co.
Bradford Machine Tool Co.
Buffalo Forge Co.
Buhr Machine Tool Co.
Canedy-Otto Mfg. Co.
Cincinnati Bickford Tool Co.
Cross Co.
Delta Manufacturing Co.
Foote-Burt Co.
Fosdick Machine Tool Co.
Greenlee Bros. & Co.
Henry & Wright Mfg. Co.
Ingersoll Milling Mch. Co.
Kingsbury Mch. Tool Corp.
Langelier Mfg. Co.
Leland-Gifford Co.
Moline Tool Co.
National Automatic Tool Co.
Pratt & Whitney Co.
Production Mch. Co.
Sellers, Wm., & Co., Inc.
Taylor & Fenn Co.

Radial
American Tool Wks. Co.
Canedy-Otto Mfg. Co.
Carlton Machine Tool Co.
Cincinnati Bickford Tool Co.
Foote-Burt Co.
Fosdick Machine Tool Co.

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RANGE
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and metals

This 27-lb cam is a component of the Sperry M7 anti-aircraft director. Serving this vital equipment called for a range control in metal characteristics: a close-

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- | | |
|--|--------------------------|
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| 2. Impact Resistance | 6. Toughness |
| 3. Corrosion Resistance | ✓ 7. Rigidity |
| ✓ 4. Wear Resistance | ✓ 8. Machinability |
| | 9. Pressure Tightness |
| | 10. Vibration Absorption |

Meehanite castings permit close control of physical properties for your specific application. Write for Meehanite Engineering Handbook

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4063

Giddings & Lewis Mch. Tool Co.
Sellers, Wm., & Co., Inc.

Rail

See Drilling Machines, Gang.

Sensitive

Atlas Press Co.
Avey Drilling Machine Co.
Buffalo Forge Co.
Canedy-Otto Mfg. Co.
Delta Manufacturing Co.
Foote-Burt Co.
Fosdick Machine Tool Co.
Henry & Wright Mfg. Co.
Langelier Mfg. Co.
Leland-Gifford Co.
Moline Tool Co.
National Automatic Tool Co.
Pratt & Whitney Co.
Production Mch. Co.
Producto Machine Co.
Ryerson, Joseph T., & Son, Inc.
Taylor & Fenn Co.
Taylor Mfg. Co.

Upright

Atlas Press Co.
Avey Drilling Machine Co.
Baker Brothers, Inc.
Barnes Drill Co.
Barnes, W. F. & John, Co.
Buffalo Forge Co.
Canedy-Otto Mfg. Co.
Cincinnati Rickford Tool Co.
Consolidated Mch. Tool Corp.
Cross Co.
Davis & Thompson Co.
Delta Manufacturing Co.
Foote-Burt Co.
Fosdick Machine Tool Co.
Ingersoll Milling Mch. Co.
Langelier Mfg. Co.
Leland-Gifford Co.
Moline Tool Co.
National Automatic Tool Co.
Production Mch. Co.
Producto Machine Co.
Rehnberg-Jacobson Mfg. Co.
Rogers Machine Works, Inc.
Ryerson, Joseph T., & Son, Inc.
Sellers, Wm., & Co., Inc.

Taylor Mfg. Co.

Wall Radial

Canedy-Otto Mfg. Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.

DRILLS

Center

Cleveland Twist Drill Co.
Gairing Tool Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Standard Tool Co.
Union Twist Drill Co.
Warner & Swasey Co.

Core

Carboloy Co., Inc.
Ex-Cell-O Corp.
Firth-Sterling Steel Co.
Gairing Tool Co.
Haynes Stellite Co.

Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.

Portable Electric

Dumore Co.
Ryerson, Joseph T., & Son, Inc.

Portable Pneumatic

Ingersoll-Rand Co.
Rotor Tool Co.

Ratchet

Armstrong Bros. Tool Co.
Cleveland Twist Drill Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Standard Tool Co.
Union Twist Drill Co.

Twist

Carboloy Co., Inc.
Cleveland Twist Drill Co.
Firth-Sterling Steel Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Standard Tool Co.
Union Twist Drill Co.

Wire

Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Standard Tool Co.
Union Twist Drill Co.

DUPLICATORS

Rockford Machine Tool Co.

DUST CONTROL SYSTEMS

Pangborn Corp.
Schnelble, Claude B., Co.

DYNAMOMETERS

Taylor Mfg. Co.

ELECTRICAL EQUIPMENT

Feedroll Corp.
General Electric Co.
Ideal Industries, Inc.
Westinghouse Electric Corp.

ELEVATORS

Otis Electric Co.

EMERY WHEELS

See Grinding Wheels.

EMERY WHEEL DRESSERS

See Dressers, Grinding Wheel.

ENGRAVING MACHINES

Gorton, George, Mch. Co.

EXTRACTORS, Screw

Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.

FACING MACHINE

Ex-Cell-O Corp.

FACING TOOLS

Clark, Robert H., Co.

FANS, Exhaust, Electric Ventilating

Buffalo Forge Co.
General Electric Co.

FEEDS FOR PRESSES, Automatic

Cleveland Punch & Shear Works Co.
Peck, Stow & Wilcox Co.
S. & S. Machine Wks.
T. S. Tool Co., Inc.
V & O Press Co.

FILES

Simonds Saw & Steel Co.

Machine

Oliver Instrument Co.

Rotary

Haskins, R. G., Co.
Lewis, B. C., Mfg. Co., Inc.
Lincoln Park Industries, Inc.
Pratt & Whitney Co.
Strand, N. A., & Co.

FILTERS, AIR

United States Electrical Tool Co.

FILTERS, COOLANT AND OIL

Cuno Engineering Corp.

FILING MACHINES, Dies, Etc.

Ames, B. C., Co.
DoAll Co.
Grob Brothers
Oliver Instrument Co.

FITTINGS, HYDRAULIC

Hydraulic Press Mfg. Co.
Watson-Stillman Co.

FLEXIBLE COUPLINGS

See Couplings, Flexible.

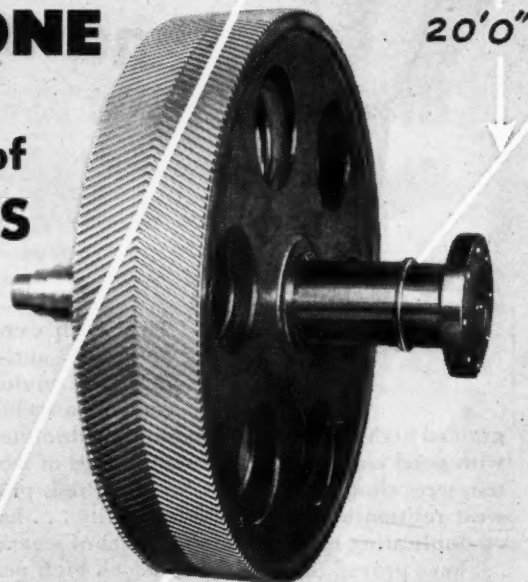
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Lewis, B. C., Mfg. Co., Inc.

BACKBONE

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You can get the power transmitting advantages of backbone in Farrel gears from 1/4 inch to 20 feet in diameter, 1/4 inch to 60 inch face, 24 DP to 0.75 DP. Made in a complete range of sizes for any power capacity, these continuous tooth, herringbone gears are known in industry as the Gear with a Backbone. Instead of the customary center



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Hill Acme Co.
National Machinery Co.

FORGINGS

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Kropp Forge Co.
Williams, J. H., & Co.

Hollow Bored

American Hollow Boring Co.
Bethlehem Steel Co.

Iron and Steel

Bethlehem Steel Co.
Jones & Laughlin Steel Corp.
Kropp Forge Co.
Morgan Engineering Co.
Steel Improvement & Forge Co.

Manganese, Bronze, Etc.

Cramp Brass & Iron Foundries Div.

Upset

Bethlehem Steel Co.
Kropp Forge Co.
Williams, J. H., & Co.

FORMING AND BENDING MOHS.

Baldwin-Southwark Corp.
Bethlehem Steel Co.
Cincinnati Shaper Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
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Yoder Co.

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U. S. Tool Co., Inc.

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National Broach & Mch. Co.
Pratt & Whitney Co.

FRAMES, Machinery, Welded

Mahon, R. C., Co.

FRICTION MATERIAL

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Manhattan-Rubber Div.

FURNACES, Equipment for Loading

Hardness

Leeds & Northrup Co.

Heat-Treating

Cooley Electric Mfg. Co.
General Electric Co.
Hayes, C. I., Inc.
Johnson Gas Appliance Co.
Leeds & Northrup Co.
Westinghouse Electric Corp.

FURNITURE, Shop

Standard Pressed Steel Co.

GAGE BLOCKS

Johansson Div., Ford Motor Co.
Pratt & Whitney Co.
Scherr, George, Co., Inc.
Van Keuren Co.

GAGES, Comparator

American Measuring Instruments Corp.
Comtor Co.
Federal Products Corp.
Jones & Lamson Machine Co.
Pratt & Whitney Co.
Scherr, George, Co., Inc.
Sheffield Corp.
Woodworth, N. A., Co.

Depth

American Measuring Instruments Corp.
Brown & Sharpe Mfg. Co.
Federal Products Corp.
Scherr, George, Co., Inc.
Standard Gage Co., Inc.
Starrett, L. S., Co.

Dial

American Measuring Instruments Corp.
Ames, R. C., Co.
Bristol Co.
Brown & Sharpe Mfg. Co.
Federal Products Corp.
Scherr, George, Co., Inc.
Sheffield Corp.
Standard Gage Co., Inc.
Starrett, L. S., Co.

Electric

American Measuring Instruments Corp.
Pratt & Whitney Co.

Height

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Brown & Sharpe Mfg. Co.
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Standard Gage Co.
Starrett, L. S., Co.

Plug, Ring and Snap

American Measuring Instruments Corp.
Axelson Mfg. Co.

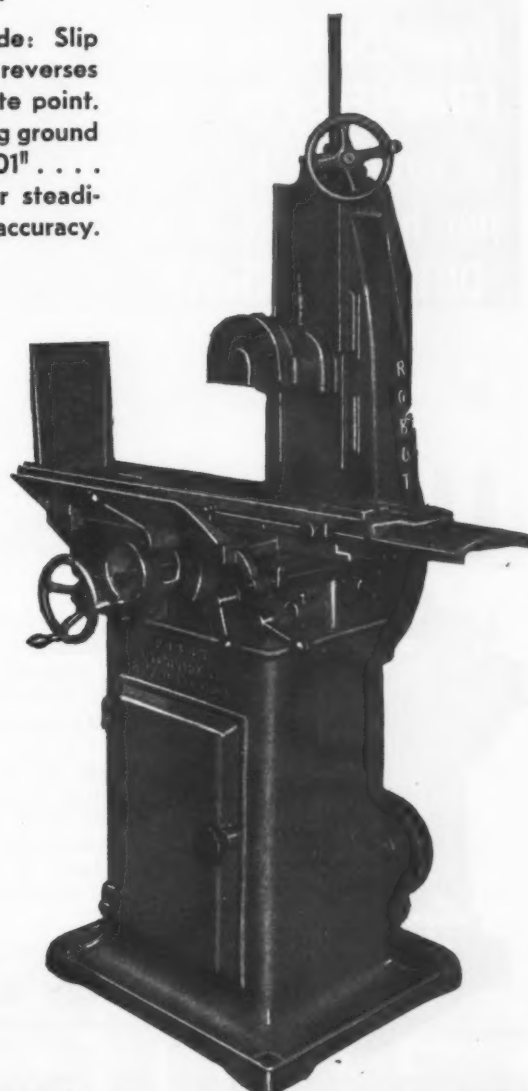
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Kennametal, Inc.
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Merz Engineering Co.
Morse Twist Drill & Machine Co.
Pratt & Whitney Co.
Scherr, George, Co., Inc.
Sheffield Corp.
Standard Gage Co., Inc.
Starrett, L. S., Co.
Stiger Precision Products Co.
Van Keuren Co.
Vincor Corp.
Woodworth, N. A., Co.

Surface
American Measuring Instruments Corp.
Brown & Sharpe Mfg. Co.
Columbus Die, Tool & Mch. Co.
Standard Gage Co., Inc.
Starrett, L. S., Co.

Taper
Brown & Sharpe Mfg. Co.
Johansson Div., Ford Motor Co.

Pratt & Whitney Co.
Sheffield Corp.
Standard Gage Co., Inc.
Starrett, L. S., Co.
Vincor Corporation

Thread
American Measuring Instruments Corp.
Axelson Mfg. Co.
Bath, John, & Co., Inc.
Brown & Sharpe Mfg. Co.
Detroit Tap & Tool Co.
Federal Products Corp.
Greenfield Tap & Die Corp.
Hanson-Whitney Machine Co.
Jones & Lamson Machine Co.
Lincoln Park Industries, Inc.
Merz Engineering Co.
Pratt & Whitney Co.
Sheffield Corp.
Starrett, L. S., Co.
Vincor Corporation
Woodworth, N. A., Co.

GASKETS
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Raybestos-Manhattan, Inc.,
Manhattan-Rubber Div.

GEAR BLANKS, Non-Metallic
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Ganschow Gear Co.
General Electric Co.
Westinghouse Electric Corp.

GEAR BURNISHING MACHINES
Fellows Gear Shaper Co.
GEAR CHECKING INSTRUMENTS AND EQUIPMENT

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Gleason Works
Michigan Tool Co.
National Broach & Mch. Co.
Pratt & Whitney Co.
Scherr, George, Co., Inc.
Vincor Corporation

GEAR CUTTING MACHINES, Bevel (Generator)
Bilgram Gear & Machine Wks.
Gleason Works

(Rotary Cutter)
Newark Gear Cutting Machine Co.
Producto Machine Co.
Waltham Mch. Wks.

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Farrel-Birmingham Co., Inc.
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Newark Gear Cutting Machine Co.
New Jersey Gear & Mfg. Co.
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Shear-speed Type
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Gleason Works

GEAR CUTTING MACHINES, Worm and Worm Wheels
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(Straight and Hourglass Type)
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Michigan Tool Co.

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Pratt & Whitney Co.
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Gleason Works

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Gleason Works
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See Speed Reducers.

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National Broach & Mch. Co.

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Fellows Gear Shaper Co.
Newark Gear Cutting Machine Co.
Pratt & Whitney Co.
Scherr, George, Co., Inc.
Vincor Corp.

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Beaver Gear Works, Inc.
Bethlehem Steel Co.
Bilgram Gear & Machine Works
Boston Gear Works, Inc.
Braun Gear Co.
Cincinnati Gear Co.
Cleveland Worm & Gear Co.
Cone Drive Div., Michigan Tool Co.
DeLaval Steam Turbine Co.
Detroit Bevel Gear Co.
Dieffendorf Gear Corp.
Earle Gear & Mch. Co.
Eberhardt-Denver Co.
Fairfield Mfg. Co.
Farrel-Birmingham Co., Inc.
Fellows Gear Shaper Co.
Foote Bros. Gear & Machine Corp.
Ganschow Gear Co.
Gear Specialties
General Electric Co.
Gleason Works
Grant Gear Wks., Inc.
Hartford Special Mch. Co.
Massachusetts Gear & Tool Co.
Meisel Press Mfg. Co.
Michigan Tool Co.
Newark Gear Cutting Machine Co.
New Jersey Gear & Mfg. Co.
Ohio Gear Co.
Perkins Mch. & Gear Co.
Philadelphia Gear Works
Pittsburgh Gear & Machine Co.
Sier-Bath Co.
Stahl Gear & Machine Co.
Taylor Mch. Co.
Westinghouse Electric Corp.

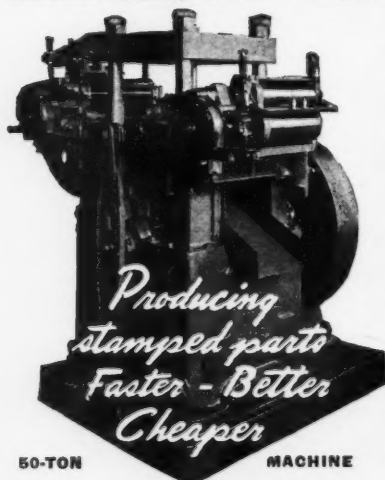
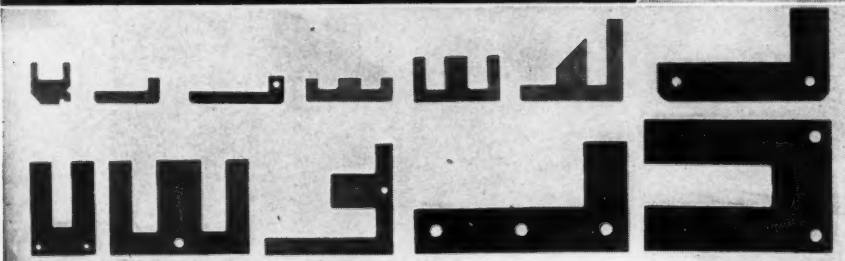
Molded
Foote Bros. Gear & Machine Corp.
Philadelphia Gear Works
Westinghouse Electric Corp.

Rawhide and Non-Metallic
Atlantic Gear Works, Inc.
Boston Gear Works, Inc.
Braun Gear Co.
Cincinnati Gear Co.
Dieffendorf Gear Corp.
Earle Gear & Mch. Co.
Foote Bros. Gear & Machine Corp.
Ganschow Gear Co.
General Electric Co.
Grant Gear Works, Inc.
Hartford Special Mch. Co.
Massachusetts Gear & Tool Co.
Meisel Press Mfg. Co.
Philadelphia Gear Works
Pittsburgh Gear & Machine Co.
Stahl Gear & Machine Co.
Taylor Mch. Co.
Westinghouse Electric Corp.

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General Electric Co.
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per hr. ON H & W
DIEING MACHINES



50-TON

MACHINE

The typical power and radio transformer laminations pictured at the left range from .003" high silicon steel to .025" nickel alloy steel. Produced complete-per-stroke on Dieing Machines at rates up to 36,000 per hour, they represent the highest standard of perfection as to clean edges and uniformity. Whether simple or intricate, most stampings can be produced complete-per-stroke on Dieing Machines at savings of 60% to 90%. Precision of product can be held within .0002" limits if required.

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HENRY & WRIGHT MFG. CO.
464 Windsor Street, Hartford 1, Connecticut

HENRY & WRIGHT DIEING MACHINES

Master Electric Co.
Reliance Electric & Mfg. Co.
Westinghouse Electric Corp.

GOGGLES

American Optical Co.

GRADUATING MACHINES

Gorton, George, Mch. Co.
Noble & Westbrook Mfg. Co.

GREASE

Cities Service Oil Co.
Gulf Oil Corp.
Shell Oil Co., Inc.
Standard Oil Co. (Indiana)
Sun Oil Co.
Texas Co.
Tide Water Associated Oil Co.

GRINDERS

Carbide Tool

Oliver Instrument Co.
Sundstrand Mch. Tool Co.

Die and Mold

Consolidated Mch. Tool Corp.
Dumore Co.
Haskins, R. G., Co.
Pratt & Whitney Co.

Oilstone, for Woodworking Tools

Mummert-Dixon Co.

Pneumatic

Cleveland Pneumatic Tool Co.
Ingersoll-Rand Co.
Madison-Kipp Corp.
Rotor Tool Co.

Portable Electric and Toolpost

Dumore Co.
Haskins, R. G., Co.

GRINDING MACHINES

Abrasive Belt

Delta Manufacturing Co.
DoAll Co.
Hill Acme Co.
Mattison Mch. Wks.
Porter-Cable Machine Co.
Production Machine Co.
Walker-Turner Co., Inc.
Walls Sales Corp.

Bench

Atlas Press Co.
Crystal Lake Grinders
Delta Manufacturing Co.
Hardinge Brothers, Inc.
Rivett Lathe & Grinder, Inc.
Ryerson, Joseph T., & Son, Inc.
Walker-Turner Co., Inc.

Broach

Gear Grinding Machine Co.

Camshaft

Landis Tool Co.
Norton Co.

Carbide Tool

Carboloy Co., Inc.
Ex-Cell-O Corp.
Oliver Instrument Co.

Centerless

Cincinnati Grinders, Inc.
Heald Machine Co.
Landis Tool Co.
Triplex Machine Tool Corp.

Chaser or Die

Eastern Mch. Screw Corp.
Fitchburg Grinding Mch. Corp.
Geometric Tool Co.
Landis Machine Co., Inc.

Chuckling

Bryant Chuckling Grinder Co.
Fitchburg Grinding Mch. Corp.

Crankschaft

Landis Tool Co.
Norton Co.

Cylinder

Bryant Chuckling Grinder Co.
Heald Machine Co.
Landis Tool Co.

Cylindrical

Arter Grinding Machine Co.
Brown & Sharpe Mfg. Co.
Cincinnati Grinders, Inc.
Crystal Lake Grinders
Fitchburg Grinding Mch. Corp.
Landis Tool Co.
Modern Tool Wks.
(Cons. Mch. Tool Corp.)
Morse Twist Drill & Mch. Co.
Norton Co.
Pratt & Whitney Co.
Rivett Lathe & Grinder, Inc.
Thompson Grinder Co.
Triplex Machine Tool Corp.

Disc

Beely, Chas. H., & Co.
Gardner Machine Co.
Hanchett Mfg. Co.
Porter-Cable Machine Co.
Production Mch. Co.

Drill

Delta Manufacturing Co.
Gallmeyer & Livingston Co.
Oliver Instrument Co.
Sellers, Wm., & Co., Inc.
Union Twist Drill Co.

AN OUTLINE
OF OUR OUTPUT

Perkins Makes:

Spiral Gears . . . Spur Gears . . .
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In All Materials:

Brass . . . Steel . . . Monel Metal . . .
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Steel . . . Cast Alloys . . . Bronze . . .
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Perkins' only job is making gears to customers' specifications. You can depend on Perkins for prompt submission of accurate estimates—and for prompt delivery of accurate gears. Your inquiry will receive immediate attention.

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Face

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Hanchett Mfg. Co.
Oliver Instrument Co.

Flexible Shaft

See Flexible Shaft Equipment.

Gear Tooth

Gear Grinding Machine Co.
Pratt & Whitney Co.

For Sharpening Turning and Planing Tools

Delta Manufacturing Co.
Oliver Instrument Co.
Production Mch. Co.
Sellers, Wm., & Co., Inc.
Walker, O. S., Co., Inc.
Waltham Mch. Wks.

Internal

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Heald Machine Co.
Landis Tool Co.
Modern Tool Wks.
(Cons. Mch. Tool Corp.)
Rivett Lathe & Grinder, Inc.

Jig

Moore Special Tool Co., Inc.

Knife and Shear Blade

Bridgeport Safety Emery Wheel Co., Inc.
Hill Acme Co.

Piston Ring

Arter Grinding Machine Co.
Bridgeport Safety Emery Wheel Co., Inc.
Heald Machine Co.

Profile

Boyar-Shultz Corp.

Pulleys

Abrasive Mch. Tool Co.

Radial, Ball Race, Etc.

Landis Tool Co.

Radius, Link

Consolidated Mch. Tool Corp.
Sundstrand Mch. Tool Co.

Ring Wheel

Reely, Chas. H., & Co.
Bridgeport Safety Emery Wheel Co., Inc.
Gardner Machine Co.

Roll

Farrel-Birmingham Co., Inc.
Landis Tool Co.
Norton Co.

Spline

Fitchburg Grinding Machine Corp.
Gear Grinding Machine Co.
Vincor Corporation

Surface

Abrasive Mch. Tool Co.
Arter Grinding Machine Co.
Blanchard Mch. Co.
Brown & Sharpe Mfg. Co.
DoAll Co.
Foot-Burt Co.
Gallmeyer & Livingston Co.
Gardner Mch. Co.
Hanchett Mfg. Co.
Heald Machine Co.
Hill Acme Co.
Mattison Machine Works
Norton Co.
Pratt & Whitney Co.
Prodnco Machine Co.
Reid Bros. Co., Inc.
Robot Machinery Co.
Thompson Grinder Co.
Walker, O. S., Co., Inc.

Tap

Ex-Cell-O Corp.
Jones & Lamson Mch. Co.

Thread

Ex-Cell-O Corp.
Jones & Lamson Mch. Co.
Landis Machine Co., Inc.

Universal, for Sharpening Cutters, Reamers, Hobs, Etc.

Barber-Colman Co.
Brown & Sharpe Mfg. Co.
Cincinnati Milling Mch. Co.
DoAll Co.
Fellows Gear Shaper Co.
(Helical Gear Shaper Cutters)
Fitchburg Grinding Mch. Corp.
Gallmeyer & Livingston Co.
Ingersoll Milling Mch. Co.
Landis Tool Co.
LeBlond, R. K., Mch. Tool Co.
Norton Co.
Oliver Instrument Co.
Pratt & Whitney Co.
Thompson Grinder Co.
Union Twist Drill Co.

Worm

Gear Grinding Machine Co.
Jones & Lamson Mch. Co.
Pratt & Whitney Co.

GRINDING WHEELS

Rakelitte Corp.
Ray State Abrasive Co.
Reely, Chas. H., & Co.
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Bridgeport Safety Emery Wheel Co., Inc.
Carborundum Co.

Electro Refractories & Alloy Corp.

Norton Co.
Raybestos-Manhattan, Inc.,
Manhattan-Rubber Div.
Simonds Abrasive Co.
Vitrified Wheel Co.

GROOVING TOOL, INTERNAL

Waldes Kohinoor, Inc.

GUARDS FOR PRESSES

Searjeant Metal Products, Inc.

HAMMERS, Drop

Bilas, E. W., Co.
Chambersburg Engineering Co.
Morgan Engineering Co.

Pneumatic

Cleveland Pneumatic Tool Co.
Madison-Kipp Corp.

Power

McKiernan-Terry Corp.
Quickwork-Whiting Div. of Whiting Corp.

Soft

Chambersburg Engineering Co.
S. & H. Soft Hammer Products Co.

Steam

Chambersburg Engineering Co.
Sellers, Wm., & Co., Inc.

HANGERS, Shaft

Boston Gear Works, Inc.
Foot Bros. Gear & Machine Corp.
Hill Acme Co.
Hyatt Bearings Div.,
General Motors Sales Corp.
Sellers, Wm., & Co., Inc.
S. K. F. Industries, Inc.
Standard Pressed Steel Co.

HARDENING EQUIPMENT, INDUCTION

Lepel High Frequency Laboratories, Inc.
Ohio Chankshaft Co.

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Shore Instrument & Mfg. Co.
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Cook, Asa S., Co. (cold)
National Machinery Co.

HEAT TREATMENT OF STEEL

Bennett Metal Treating Co.
Ohio Gear Co.
Perfection Tool & Metal Heat Treating Co.
Pittsburgh Gear Mch. Co.

HOBBSING MACHINES

See Gear Cutting Machines, Helical and Spur (Hob), and Gear Cutting Machines, Worm and Worm Wheels.

HOBS

Barber-Colman Co.
Brown & Sharpe Mfg. Co.
Michigan Tool Co.
National Twist Drill & Tool Co.
New Jersey Gear & Mfg. Co.
Union Twist Drill Co.

HOIST HOOKS

Bethlehem Steel Co.
Williams, J. H., & Co.

HOISTING AND CONVEYING MACHINERY

Master Electric Co.
Shepard Niles Crane & Hoist Corp.

HOISTS, Air

Hanna Engineering Works
Ingersoll-Rand Co.

Chain, Etc.

Ryerson, Joseph T., & Son, Inc.
Union Mfg. Co.

Electric

Philadelphia Gear Works
Shepard Niles Crane & Hoist Corp.
Union Mfg. Co.

HONES

Carborundum Co.
General Tool & Die Co.
Micromatic Hone Corp.
Moline Tool Co.
Sunnen Products Co.

HONING MACHINES, Internal (Cylinder)

Barnes Drill Co.
Barnes, W. F. and John, Co.
Micromatic Hone Corp.
Moline Tool Co.
Sunnen Products Co.

HONING MACHINES, External

Barnes Drill Co.
Micromatic Hone Corp.

HOSE, Leather, Rubber, Metallic, Etc.

American Metal Hose Div.,
American Brass Co.
Cleveland Pneumatic Tool Co.
Raybestos-Manhattan, Inc.
Manhattan-Rubber Div.

HYDRAULIC MACHINERY, Tools and Equipment

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Barnes, John S., Corp.

Bethlehem Steel Co.

Birdsboro Steel Fdry. & Mch. Co.
Bilas, E. W., Co.
Chambersburg Engineering Co.
Cross Co.
Denison Engineering Co.
Elmes Engineering Works
Farquhar, A. B., Co.
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
Hydropress Co., Inc.
Lake Erie Engineering Corp.
Oilgear Co.
Rockford Machine Tool Co.
Sundstrand Mch. Tool Co.
Watson-Stillman Co.

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Barnes Drill Co.
Barnes, John S., Corp.
Barnes, W. F. and John, Co.
Ex-Cell-O Corp.
Hannifin Mfg. Co.
Hydraulic Machinery, Inc.
National Automatic Tool Co.

HYDRAULIC, Tool Head or Power Unit

Barnes Drill Co.
National Automatic Tool Co.
New Britain-Gridley Mch. Div.
New Britain Machine Co.

INDEX CENTERS

Abrasive Mch. Tool Co.
Brown & Sharpe Mfg. Co.
Kempnath Mch. Co.
Vincor Corporation

INDEXING and Spacing Fixtures

Grinders & Fixtures, Inc.
Hartford Special Mchry. Co.
Vincor Corporation
Zagar Tool, Inc.

INDICATOR, Dial

American Measuring Instrument Corp.
Ames, B. C., Co.
Brown & Sharpe Mfg. Co.
Federal Products Corp.
Standard Gage Co., Inc.
Starrett, L. S., Co.

Speed

Bristol Co.
Brown & Sharpe Mfg. Co.
Starrett, L. S., Co.
Veeder-Root, Inc.

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Brown & Sharpe Mfg. Co.
Federal Products Corp.
Standard Gage Co., Inc.
Starrett, L. S., Co.

INDUCTION HEATING EQUIPMENT

Lepel High Frequency Laboratories, Inc.
Ohio Crankshaft Co.

INGOTS, Manganese, Bronze and Brass

Cramp Brass & Iron Foundries Div.

INTENSIFIERS, Hydraulic

Baldwin-Southwark Corp.
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Farquhar, A. B., Co.
Hydraulic Press Mfg. Co.
Morgan Engineering Co.
Watson-Stillman Co.

JACKS, Planer

Armstrong Bros. Tool Co.

JIG BORER

See Boring Machines, Jig.

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American Measuring Instruments Corp.
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Hartford Special Mchry. Co.
Ingersoll Milling Mch. Co.
Levanport Machine Co., Inc.
Merz Engineering Co.
Sundstrand Mch. Tool Co.
Vincor Corporation
Wade Tool Co.

KEYSEATERS

Baker Bros., Inc.
Consolidated Mch. Tool Corp.
Davis Keyseater Co.
Lapointe Machine Tool Co.

KNURL HOLDERS

Brown & Sharpe Mfg. Co.
Graham Mfg. Co., Inc.
Pratt & Whitney Co.

KNURLING TOOLS

Armstrong Bros. Tool Co.
Graham Mfg. Co., Inc.
Pratt & Whitney Co.
Williams, J. H., & Co.

LAPPING MACHINES

Cincinnati Grinders, Inc.
Ex-Cell-O Corp.
Fellows Gear Shaper Co.
Norton Co.
Sommer & Adams Co.
Splitfire Tools, Inc.

LATHE ATTACHMENTS

American Tool Wks. Co.
Atlas Press Co.
Bradford Machine Tool Co.
Gisholt Mch. Co.
Hendey Machine Co.
Jones & Lamson Mch. Co.

LeBlond, R. K., Mch. Tool Co.

Lodge & Shipley Mch. Tool Co.
McCroskey Tool Corp.
Monarch Mch. Tool Co.
Newton Mfg. Co.
Pratt & Whitney Co.
Reed-Prentice Corp.
Rivett Lathe & Grinder, Inc.
Seneca Falls Mch. Co.
South Bend Lathe Wks., Inc.
Springfield Mch. Tool Co.
Stark Tool Co.
Sundstrand Mch. Tool Co.
Wade Tool Co.
Warner & Swasey Co.

LATHE AND GRINDING DOGS

Armstrong Bros. Tool Co.
Williams, J. H., & Co.

LATHES

Automatic

Baird Machine Co.
Cross Co.
Gisholt Mch. Co.
Goss & DeLewy Mch. Co.
Jones & Lamson Mch. Co.
LeBlond, R. K., Mch. Tool Co.
Lodge & Shipley Mch. Tool Co.
Monarch Mch. Tool Co.
National Acme Co.
New Britain-Gridley Mch. Div.,
New Britain Machine Co.
Porter-Cable Machine Co.
Potter & Johnston Mch. Co.
Pratt & Whitney Co.
Reed-Prentice Corp.
Seneca Falls Mch. Co.
Sundstrand Mch. Tool Co.

Axes and Shaft

Consolidated Mch. Tool Corp.
Cross Co.
LeBlond, R. K., Mch. Tool Co.
Lodge & Shipley Mch. Tool Co.
Sellers, Wm., & Co., Inc.
Seneca Falls Mch. Co.
Sundstrand Mch. Tool Co.

Bench

Ames, R. C., Co.
Ames Precision Mch. Wks.
Atlas Press Co.
Elgin Tool Wks., Inc.
Harding Brothers, Inc.
LeBlond, R. K., Mch. Tool Co.
Pratt & Whitney Co.
Rivett Lathe & Grinder, Inc.
Seneca Falls Mch. Co.
Sheldon Mch. Co.
South Bend Lathe Wks.
Stark Tool Co.
Wade Tool Co.

Boring

Gisholt Mch. Co.
LeBlond, R. K., Mch. Tool Co.
Lodge & Shipley Mch. Tool Co.

Brass Workers'

Arme Machine Tool Co.
Bardons & Oliver, Inc.
Gisholt Mch. Co.
Seneca Falls Mch. Co.
Springfield Mch. Tool Co.
Warner & Swasey Co.

Crankshaft

Consolidated Mch. Tool Corp.
Cross Co.
LeBlond, R. K., Mch. Tool Co.
Sundstrand Mch. Tool Co.

Double-End

Consolidated Mch. Tool Corp.
LeBlond, R. K., Mch. Tool Co.
Sundstrand Mch. Tool Co.

Engine and Toolroom

Arme Machine Tool Co.
American Tool Wks. Co.
Atlas Press Co.
Axelson Manufacturing Co.
Bradford Machine Tool Co.
Consolidated Mch. Tool Corp.
Hendey Machine Co.
LeBlond, R. K., Mch. Tool Co.
Lehmann Machine Co.
Lodge & Shipley Mch. Tool Co.
Logan Engineering Co.
Mackintosh & Hemphill Co.
Monarch Mch. Tool Co.
Morey Machinery Co., Inc.
Pratt & Whitney Co.
Reed-Prentice Corp.
Rivett Lathe & Grinder, Inc.
Seneca Falls Mch. Co.
Sheldon Mch. Co.
Sidney Machine Tool Co.
Simmons Machine Tool Corp.
South Bend Lathe Wks.
Springfield Mch. Tool Co.

Extension Bed and Gap

Gisholt Mch. Co.
LeBlond, R. K., Mch. Tool Co.
Lodge & Shipley Mch. Tool Co.
Seneca Falls Mch. Co.
South Bend Lathe Wks.
Warner & Swasey Co.

Gun

Consolidated Mch. Tool Corp.
LeBlond, R. K., Mch. Tool Co.
Lodge & Shipley Mch. Tool Co.
Seneca Falls Mch. Co.
Springfield Mch. Tool Co.

Manufacturing Type

Line-Rollway Corporation
Lodge & Shipley Mch. Tool Co.

Spinning
See Chucking Machines.

Toolroom
See Lathes, Engine and Toolroom.

Turret
Arms Machine Tool Co.
Bardons & Oliver, Inc.
Brown & Sharpe Mfg. Co.
Bullard Company
Foster Div., International Detrola Corp.
Gisholt Mch. Co.
Hardinge Brothers, Inc.
(Bench or Cabinet Mounting)
Jones & Lamson Mch. Co.
LeBlond, R. K., Mch. Tool Co.
Moser Machinery Co.
National Arms Co.
Oster Mfg. Co.
Potter & Johnston Mch. Co.
Production Machine Co.
Rivett Lathe & Grinder, Inc.
Simmons Machine Tool Corp.
South Bend Lathe Wks., Inc.
Springfield Mch. Tool Co.
Stark Tool Co.
Stearns-Roger Mfg. Co.
Wade Tool Co.
Warner & Swasey Co.

Turret Automatic
Potter & Johnston Mch. Co.

Vertical Turret
Bullard Company
Rogers Machine Works, Inc.

LEVELS
Pratt & Whitney Co.
Starrett, L. S., Co.
Universal Boring Mch. Co.

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants
Cities Service Oil Co.
Gulf Oil Corp.
Shell Oil Co., Inc.
Sinclair Refining Co.
Socony Vacuum Oil Co., Inc.
Standard Oil Co. (Indiana)
Stuart, D. A., Oil Co., Ltd.
Sun Oil Co.
Texas Co.
Tide Water Associated Oil Co.

LUBRICATING SYSTEMS
Madison-Kipp Corp.
Manzel Brothers Co.
Rivett Lathe & Grinder, Inc.

MACHINISTS' SMALL TOOLS
See Calipers, Hammers, Wrenches, Drills, Taps, Etc.

MAGNESIUM
Dow Chemical Co.

MANDRELS
See Arbors and Mandrels.

MARKING MACHINES AND DEVICES
Colonial Broach Co.
Ideal Industries, Inc.
Noble & Westbrook Mfg. Co.
Sommer, Inc.

MEASURING MACHINES AND INSTRUMENTS, PRECISION
American Measuring Instruments Corp.
Federal Products Corp.
Hanson-Whitney Mch. Co.
Norma-Hoffmann Bearings Corp.
Pratt & Whitney Co.
Scherr, George, Co., Inc.
Van Keuren Co.
Vince Corporation

MEASURING WIRES
Thread, Spine and Gear
American Measuring Instruments Corp.
Van Keuren Co.

METAL DISINTEGRATOR
Elor Corp.

METALS, Bearing
See Bearings, Bronze, Babbitt, Etc. and Bushings, Brass, Bronze, Etc.

METALS, Perforated
Chicago Perforating Co.

METERS
See Recording Instruments.

MICROMETERS
Bath, John, & Co., Inc.
Brown & Sharpe Mfg. Co.
Davis & Thompson Co.
Pratt & Whitney Co.
Scherr, George, Co., Inc.
Starrett, L. S., Co.
Van Keuren Co.

MICROSCOPES, Toolmakers
Scherr, George, Co., Inc.

MILLING ATTACHMENTS
Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Consolidated Mch. Tool Corp.
Egan Tool Wks., Inc.
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Kempnith Mch. Co.
Parker-Cable Machine Co.

Reed-Prentice Corp.
Rivett Lathe & Grinder, Inc.
Sundstrand Mch. Tool Co.
Van Norman Co.

MILLING MACHINES
Automatic
Cincinnati Milling Machine Co.
Consolidated Mch. Tool Corp.
Cross Co.
Ingersoll Milling Mch. Co.
Jones & Lamson Mch. Co.
Kearney & Trecker Corp.
Sundstrand Mch. Tool Co.
U. S. Tool Company, Inc.

Bench
Ames, B. C., Co.
Atlas Press Co.
Burke Machine Tool Co.
Hardinge Brothers, Inc.
(Bench or Pedestal Type)
Pratt & Whitney Tool Co.
Stark Tool Co.

Circular Continuous
Consolidated Mch. Tool Corp.
Cross Co.
Davis & Thompson Co.
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Sundstrand Mch. Tool Co.

Die Sinking
See Die Sinking Machines.

Duplex
Cincinnati Milling Machine Co.
Consolidated Mch. Tool Corp.
Cross Co.
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Taylor & Fenn Co.

Hand
Burke Machine Tool Co.
Frew Machine Co.
Nichols, W. H., & Sons
Sundstrand Mch. Tool Co.
Van Norman Co.

Horizontal, Plain and Universal
Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Consolidated Mch. Tool Corp.
Cross Co.
DoAll Co.
Frew Machine Co.
Gorton, George, Mch. Co.
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Kempnith Mch. Co.
Machinery Mfg. Co.
Ohio Machine Tool Co.
Producto Machine Co.
Sidney Machine Tool Co.
Simmons Machine Tool Corp.
Sundstrand Mch. Tool Co.
Van Norman Mch. Tool Co.

Lincoln Type
Brown & Sharpe Mfg. Co.
Sundstrand Mch. Tool Co.

Planer Type
Cincinnati Planer Co.
Consolidated Mch. Tool Corp.
Davis & Thompson Co.
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Sellers, Wm., & Co., Inc.
Stokerunit Corp.

Planetary
Cross Gear & Machinery Co.

Ram Type, Universal
Van Norman Co.

Vertical
Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Consolidated Mch. Tool Corp.
Cross Co.
DoAll Co.
Gorton, George, Mch. Co.
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Machinery Mfg. Co.
Pratt & Whitney Co.
Reed-Prentice Corp.
Sidney Machine Tool Co.
Sommer & Adams Co.
Sundstrand Mch. Tool Co.
Taylor & Fenn Co.

MODEL AND EXPERIMENTAL WORK
See Special Machinery Tools.

MOLD AND DIE COPYING MACHINES
Gorton, George, Mch. Co.

MOLDING MACHINES, Plastic Products
Hydraulic Press Mfg. Co.
Reed-Prentice Corp.
Watson-Stillman Co.

MOLYBDENUM
Climax Molybdenum

MOTORS, Electric
Dumore Co.
General Electric Co.
Lincoln Electric Co.
Master Electric Co.
Reliance Electric & Engrs. Co.
Star Electric Motor Co.
Westinghouse Electric Corp.

MOUNTINGS, RUBBER, JOINTS AND COUPLINGS
Lord Manufacturing Co.
Raybestos-Manhattan, Inc.,
Manhattan Rubber Div.

MULTIPLE-SLIDE FORMING MACHINES
Baird Machine Co.
U. S. Tool Co., Inc.

NAME PLATES
Noble & Westbrook Mfg. Co.

NIBBLING MACHINES
Campbell, Andrew C., Div., American Chain & Cable Co., Inc.
Gray Machine Co.

NIPPLE THREADING MACHINERY
Landis Mch. Co., Inc.
Oster Manufacturing Co.

NUMBERING MACHINES
Noble & Westbrook Mfg. Co.

NUT MAKING MACHINERY
National Machinery Co.

NUT SETTING EQUIPMENT
See Screw Driving and Nut Setting Equipment.

NUT TAPPERS
See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap
Parker-Kalon Corp.
Republic Steel Corp.
(Union Drawn Steel Div.)

NUTS, Self-Locking
Elastic Stop Nut Corp. of America

NUTS, Thumb or Wing and Cap
Republic Steel Corp.
(Union Drawn Steel Div.)
Williams, J. H., & Co.

OIL CAPS
Bealy, Chas. H., & Co.
Gits Bros. Mfg. Co.
Trico Fuse Mfg. Co.

OIL EXTRACTORS
DeLaval Separator Co.

OIL GROOVERS
Hanson-Whitney Mch. Co.

OIL HOLE COVERS
Gits Bros. Mfg. Co.

OILERS AND LUBRICATORS
Gits Bros. Mfg. Co.
Madison-Kipp Corp.
Manzel Brothers Co.
Trico Fuse Mfg. Co.

OILS, Cutting
Cimcool Div., Cincinnati Milling Machine Co.
Cities Service Oil Co.
Gulf Oil Corp.
Shell Oil Co., Inc.
Stuart, D. A., Oil Co., Ltd.
Sun Oil Co.
Texas Co.
Tide Water Associated Oil Co.

Lubricating
Bealy, Chas. H., & Co.
Cities Service Oil Co.
Gulf Oil Corp.
Shell Oil Co., Inc.
Sinclair Refining Co.
Socony Vacuum Oil Co. Inc.
Standard Oil Co. (Indiana)
Stuart, D. A., Oil Co., Ltd.
Sun Oil Co.
Texas Co.
Tide Water Associated Oil Co.

Quenching and Tempering
Cities Service Oil Co.
Gulf Oil Corp.
Shell Oil Co., Inc.
Standard Oil Co. (Indiana)
Stuart, D. A., Oil Co., Ltd.

Soluble
See Compounds, Cutting, Grinding, Metal Drawings, Etc.

ORDNANCE MACHINES, Special
Rehnberg-Jacobson Mfg. Co.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.
Garlock Packing Co.
Raybestos-Manhattan, Inc.,
Manhattan Rubber Div.
Watson-Stillman Co.

PARALLELS
Brown & Sharpe Mfg. Co.
Johansson Div., Ford Motor Co.
Starrett, L. S., Co.
Taft-Peirce Mfg. Co.
Walker, O. S., Co., Inc.

PATTERNS, WOOD
Mummert-Dixon Co.

PHOSPHOR BRONZE—See Bronze.

PILLOW BLOCKS
Norma-Hoffmann Bearings Corp.
S K F Industries, Inc.
Standard Pressed Steel Co.

PIPE, BRASS AND COPPER
American Brass Co.

PIPE CUTTING AND THREADING MACHINES
Foote-Burt Co.
Landis Mch. Co., Inc.
Oster Manufacturing Co.

PIPE JOINTS, SWIVEL
Chicksan Co.

PIPE, STEEL
Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Jones & Laughlin Steel Corp.
National Tube Co.
(U. S. Steel Corp. Div.)
Remble Steel Corp.
(Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.

PIPE TONGS
Williams, J. H., & Co.

PISTON PINS
Bell Engineering Co.

PLANNER ATTACHMENTS
Cincinnati Planer Co.
Consolidated Mch. Tool Co.
Hanson-Whitney Mch. Co.
Rockford Machine Tool Co.

PLANERS
Baldwin-Southwark Corp.
Cincinnati Planer Co.
Consolidated Mch. Tool Corp.
(Incl. Plate, Rotary and Crank Types)
Ohio Machine Tool Co.
Rockford Machine Tool Co.
Sellers, Wm., & Co., Inc.

Openside
Cincinnati Planer Co.
Rockford Machine Tool Co.

PLASTICS and Plastic Products
Bakelite Corp.
Durez Plastics & Chemicals, Inc.

PLATE ROLLS
Baldwin-Southwark Corp.
Bethlehem Steel Co.
Cleveland Punch & Shear Wks. Co.
Consolidated Mch. Tool Corp.
Hannifin Mfg. Co.
Ryerson, Joseph T., & Son, Inc.

PLATES, Surface
Brown & Sharpe Mfg. Co.
Ideal Industries, Inc.
Jones Machine Tool Wks., Inc.
Rotor Tool Co.
Scherr, George, Co., Inc.
Taft-Peirce Mfg. Co.
T. R. Tool Company, Inc.
Vince Corporation

PNEUMATIC EQUIPMENT
Bliss, E. W., Co.
Hanna Engineering Works
Hannifin Mfg. Co.
Ingersoll-Rand Co.
Loansport Machine Co., Inc.
Valvair Corp.

POLISHING LATHES and Machines
Bealy, Chas. H., & Co.
Bridgport Safety Emery Wheel Co., Inc.
DoAll Co.
Gardner Machine Co.
Production Mch. Co.
Sundstrand Mch. Tool Co.

POLISHING TOOLS, Portable
Stow Mfg. Co.
Strand, N. A., & Co.

PRESSES
Arbor
Baldwin-Southwark Corp.
Candy-Otto Mfg. Co.
Dake Engine Co.
Elmes Engineering Works
Farnco Machine Co.
Farquhar, A. R., Co.
General Manufacturing Co.
Hannifin Mfg. Co.
Lempeo Products, Inc.
Loansport Machine Co., Inc.
Sheldon Mch. Co.
Watson-Stillman Co.
Wilson, K. R.

Broaching
American Broach & Mch. Co.
Bliss, E. W., Co.
General Manufacturing Co.
Lapointe Machine Tool Co.
Oilgear Co.
Peck, Stow & Wilcox Co.
V & O Press Co.
Watson-Stillman Co.

Extrusion
Hydraulic Press Mfg. Co.
Hydropress Co., Inc.
Lake Erie Engineering Corp.
National Machinery Co.
Watson-Stillman Co.

Foot
Baird Machine Co.
Bliss, E. W., Co.
Etna Machine Co.
Farnco Machine Co.
Niagara Machine & Tool Wks.

Peck, Stow & Wilcox Co.
Taylor & Fenn Co.
V & O Press Co.

Forging

Ajax Manufacturing Co.
Baldwin-Southwark Corp.
Bethlehem Steel Co.
Bliss, E. W., Co.
Clearing Mch. Co.
Cleveland Punch & Shear Works Co.
Farquhar, A. B., Co.
Henry & Wright Mfg. Co.
Hydraulic Press Mfg. Co.
Hydropress Co., Inc.
Lake Erie Engineering Corp.
Morgan Engineering Co.
National Machinery Co.
Niagara Machine & Tool Wks.
Peck, Stow & Wilcox Co.
Verson Allsteel Press Co.
V & O Press Co.
Watson-Stillman Co.
Zeh & Hahnemann Co.

Hydraulic

American Broach & Mch. Co.
Baldwin-Southwark Corp.
Bethlehem Steel Co.
Birdsboro Steel Fdry. & Mch. Co.
Bliss, E. W., Co.
Clearing Mch. Co.
Colonial Broach Co.
Dake Engine Co.
Denison Engineering Co.
Elmes Engineering Co.
Farrel-Birmingham Co., Inc.
Farquhar, A. B., Co.
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
Hydropress Co., Inc.
Lake Erie Engineering Corp.
Lapointe Machine Tool Co.
Morgan Engineering Co.
Oilgear Co.
Verson Allsteel Press Co.
Warren City Mfg. Co.
Watson-Stillman Co.
Wilson, K. R.

Percussion

Screw

Bliss, E. W., Co.
General Manufacturing Co.
Niagara Machine & Tool Wks.
Zeh & Hahnemann Co.

Sheet Metal Working

Baldwin-Southwark Corp.
Bliss, E. W., Co.
Cincinnati Shaper Co.
Clearing Mch. Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. & Tool Corp.
Fanco Machine Co.
Farquhar, A. B., Co.
Henry & Wright Mfg. Co.
Hydraulic Press Mfg. Co.
L & J Press Corp.
Lake Erie Engineering Corp.
Niagara Machine & Tool Wks.
Peck, Stow & Wilcox Co.
Quickwork-Whiting Div. of Whiting Corp.
Steelweld Mchry. Div. of Cleveland
Crane & Enggr. Co.
Verson Allsteel Press Co.
V & O Press Co.
Warren City Mfg. Co.
Watson-Stillman Co.
Zeh & Hahnemann Co.

Straightening

Baldwin-Southwark Corp.
Canedy-Otto Mfg. Co.
Colonial Broach Co.
Consolidated Mch. Tool Corp.
Elmes Engineering Works
Farquhar, A. B., Co.
General Manufacturing Co.
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
Jones Machine Tool Wks., Inc.
Lemco Products, Inc.
Morgan Engineering Co.
Oilgear Co.
Springfield Mch. Tool Co.
Watson-Stillman Co.

PRINT PAPER, BLUE, WHITE, ETC.

Ozalid Products Div. General Aniline & Film Corp.

PROFILING MACHINES

Consolidated Mch. Tool Corp.
Frew Machine Co.
Gorton, George, Mch. Co.
Leland-Gifford Co.
Morey Machinery Co., Inc.
Pratt & Whitney Co.
Reed-Prentice Corp.
Wade Tool Co.

PULLEYS

Boston Gear Works, Inc.
DoAll Co.
Foot Bros. Gear & Machine Corp.
Hill Acme Co.
Sellers, Wm., & Co., Inc.

Friction Clutch

Brown & Sharpe Mfg. Co.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co.
DeLaval Steam Turbine Co.
Ingersoll-Rand Co.
Logansport Machine Co., Inc.
Ruthman Machinery Co.
Tuthill Pump Co.
Viking Pump Co.

Hydraulic

Baldwin-Southwark Corp.
Barnes, John S., Corp.
Bethlehem Steel Co.
Brown & Sharpe Mfg. Co.
DeLaval Steam Turbine Co.
Elmes Engineering Works
Hydropress Co., Inc.
Ingersoll-Rand Co.
Lapointe Machine Tool Co.
McIntyre Co.
Oilgear Co.
Sundstrand Mch. Tool Co.
Tuthill Pump Co.
Viking Pump Co.
Watson-Stillman Co.

Pneumatic

Ingersoll-Rand Co.

Rotary

Brown & Sharpe Mfg. Co.
DeLaval Steam Turbine Co.
Tuthill Pump Co.
Viking Pump Co.

PUNCHES AND DIES

See Dies, Sheet Metal, etc.

PUNCHES, CENTERING

Cleveland Punch & Shear Works Co.

PUNCHING MACHINERY

Buffalo Forge Co.
Cincinnati Shaper Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
Hannifin Mfg. Co.
Niagara Machine & Tool Wks.
Peck, Stow & Wilcox Co.
Ryerson, Joseph T., & Son, Inc.
Steelweld Mchry. Div. of Cleveland
Crane & Enggr. Co.
Watson-Stillman Co.

PUNCHING AND RIVETING MACHINES

Hannifin Mfg. Co.

PRYROMETERS

Bristol Co.
Leeds & Northrup Co.
Shore Instrument & Mfg. Co.

RACK CUTTING MACHINES AND ATTACHMENTS

Gould & Eberhardt

RACKS, GEAR, CUT

Atlantic Gear Works, Inc.
Boston Gear Works, Inc.
Brown & Sharpe Mfg. Co.
Fellows Gear Shaper Co.
Foot Bros. Gear & Machine Corp.
Hartford Special Mchry. Co.
Massachusetts Gear & Tool Co.
Meisel Press Mfg. Co.
Philadelphia Gear Works
Stahl Gear & Machine Co.

REAMER HOLDERS

Gairing Tool Co.
Gisholt Machine Co.
Landis Mch. Co., Inc.
Lipe-Rollway Corporation
McCroskey Tool Corp.
Scully-Jones & Co.
Warner & Swasey Co.

REAMERS

Barber-Colman Co.
Butterfield Div., Union Twist Drill Co.
Carboloy Co., Inc.
Cleveland Twist Drill Co.
Columbus Die, Tool & Mch. Co.
Ex-Cell-O Corporation
Firth-Sterling Steel Co.
Gairing Tool Co.
Gammons-Hoaglund Co.
Gisholt Machine Co.
Greenfield Tap & Die Corp.
Haynes Stellite Co.
Lipe-Rollway Corporation
McCroskey Tool Corp.
More Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Tungsten Carbide Tool Co.
Union Twist Drill Co.

Adjustable

Barber-Colman Co.
Carboloy Co., Inc.
Cleveland Twist Drill Co.
Ex-Cell-O Corporation
Firth-Sterling Steel Co.
Gairing Tool Co.
Gammons-Hoaglund Co.
Gisholt Machine Co.
Greenfield Tap & Die Corp.
McCroskey Tool Corp.
More Twist Drill & Mch. Co.
Pratt & Whitney Co.
Rogers, John M., Tool Corp.
Standard Tool Co.
Taft-Peirce Mfg. Co.
Union Twist Drill Co.

Taper Pin

Butterfield Div., Union Twist Drill Co.
Gammons-Hoaglund Co.
Greenfield Tap & Die Corp.
Lipe-Rollway Corporation
More Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Standard Tool Co.
Union Twist Drill Co.

REAMING MACHINES

Van Norman Co.

RECORDING INSTRUMENTS

For Counting
National Acme Co.

For Electricity

Bristol Co.
General Electric Co.
Leeds & Northrup Co.

For Pressure

Bristol Co.
Leeds & Northrup Co.

For Speed

Bristol Co.
Leeds & Northrup Co.

For Temperature

Bristol Co.
Leeds & Northrup Co.

REELS, Stock, Standard and Automatic
S & S Mch. Wks.
U. S. Tool Company, Inc.

REFRACTORIES, Heat Treating
Furnace
Norton Co.

REGULATORS, Temperature

Bristol Co.
General Electric Co.
Leeds & Northrup Co.

REMOVERS, Japan, Enamel, Etc.
Oakite Products, Inc.

RETAINING RINGS FOR BEARINGS, ETC.

Waldes Kohinoor, Inc.

RHEOSTATS

Allen-Bradley Co.
General Electric Co.

RIVET SETS

Bethlehem Steel Co.
Cleveland Pneumatic Tool Co.
Cleveland Punch & Shear Works Co.

RIVETERS, Hydraulic

Bethlehem Steel Co.
Hanna Engineering Works
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
Morgan Engineering Co.

Pneumatic

Cleveland Pneumatic Tool Co.
Grant Mfg. & Mch. Co.
Hanna Engineering Works
Hannifin Mfg. Co.
Ingersoll-Rand Co.
Ryerson, Joseph T., & Son, Inc.

RIVETING MACHINES

Buffalo Forge Co.
General Riveters, Inc.
Grant Mfg. & Mch. Co.
Hanna Engineering Works
Hannifin Mfg. Co.
Peck, Stow & Wilcox Co.
Producto Machine Co.

RIVET MAKING MACHINES

Hill Acme Co.
National Machinery Co.

RIVETS

Republic Steel Corp.,
(Union Drawn Steel Div.)

RUBBER PRODUCTS

Raybestos-Manhattan, Inc.,
Manhattan Rubber Div.

RULES, Steel

Brown & Sharpe Mfg. Co.
Scherr, George, Co., Inc.
Starrett, L. S., Co.

RUST PREVENTATIVE

National Oil Products Co.
Oakite Products, Inc.
Scherr, George, Co., Inc.

SAND BLAST EQUIPMENT

See Blast Cleaning Equipment.

SANDERS

Carborundum Co.
Delta Manufacturing Co.
Ingersoll-Rand Co.
Porter-Cable Machine Co.
Rotor Tool Co.
Sundstrand Mch. Tool Co.
Walls Sales Corp.

SAW BLADES, HACK

Armstrong-Blum Mfg. Co.
Simonds Saw & Steel Co.
Starrett, L. S., Co.

SAW SHARPENING MACHINES

Earle Gear & Mch. Co.
Huth Bros. Saw Mfg. Co., Inc.
Scherr, George, Co., Inc.

SAWING MACHINES

Consolidated Mch. Tool Corp.
Earle Gear & Mch. Co.
Etna Machine Co.

Friction

Ryerson, Joseph T., & Son, Inc.

Metal Cutting Band

Armstrong-Blum Mfg. Co.
Avey Drilling Machine Co.
Delta Manufacturing Co.
DoAll Co.
Grob Brothers
Huth Bros. Saw Mfg. Co., Inc.
Ryerson, Joseph T., & Son, Inc.
Simonds Saw & Steel Co.

Power Hack

Armstrong-Blum Mfg. Co.
Ryerson, Joseph T., & Son, Inc.

SAWS, Circular Metal Cutting

Brown & Sharpe Mfg. Co.
Consolidated Mch. Tool Corp.
Espin-Lucas Machine Works
Genesee Tool Co.
Huth Bros. Saw Mfg. Co., Inc.
National Twist Drill & Tool Co.
Simonds Saw & Steel Co.
Standard Tool Co.
Union Twist Drill Co.
Walker-Turner Co., Inc.

Metal Cutting Band

Armstrong-Blum Mfg. Co.
Delta Mfg. Co.
DoAll Co., Inc.
Huth Bros. Saw Mfg. Co., Inc.
Ryerson, Joseph T., & Son, Inc.
Starrett, L. S., Co.
Tannerwitz Works
Walker-Turner Co., Inc.
Wells Manufacturing Corp.

Screw Slotting

Barber-Colman Co.
Brown & Sharpe Mfg. Co.
Greenfield Tap & Die Corp.
More Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Simonds Saw & Steel Co.
Standard Tool Co.
Starrett, L. S., Co.
Union Twist Drill Co.

SCRAPERS, Hand and Power
Anderson Bros. Mfg. Co.

SCREW DRIVING AND NUT SETTING EQUIPMENT

Errington Mechanical Laboratory
Haskins, R. G., Co.
Ingersoll-Rand Co.
Procurer Safety Chuck Co.
Strand, N. A., & Co.

SCREW MACHINES, Automatic, Single and Multiple Spindle

Brown & Sharpe Mfg. Co.
Cleveland Automatic Machine Co.
Cone Automatic Machine Co., Inc.
Foot-Burt Co.
Greenlee Bros. & Co.
National Acme Co.
New Britain-Gridley Mch. Div.,
New Britain Machine Co.
Scherr, George, Co., Inc.
Triplex Machine Tool Corp.

SCREW MACHINES, Hand

See also Lathes, Turret.
Acme Machine Tool Co.
Bardons & Oliver, Inc.
Brown & Sharpe Mfg. Co.
Gisholt Mch. Co.
Harding Brothers, Inc.
Jones & Lamson Machine Co.
Rivett Lathe & Grinder, Inc.
Simmons Machine Tool Corp.
Stark Tool Co.
Wade Tool Co.
Warner & Swasey Co.

SCREW MACHINE TOOLS AND EQUIPMENT

Bardons & Oliver, Inc.
Brown & Sharpe Mfg. Co.
Cleveland Automatic Machine Co.
Gisholt Mch. Co.
Greenlee Bros. & Co.
Jones & Lamson Machine Co.
Landis Mch. Co., Inc.
National Acme Co.
New Britain-Gridley Mch. Div.,
New Britain Machine Co.
Potter & Johnston Machine Co.
Rat L Tools
Warner & Swasey Co.

SCREW MACHINE WORK

Aluminum Co. of America
Eastern Mch. Screw Corp.
More Twist Drill & Mch. Co.
National Acme Co.
Standard Pressed Steel Co.

SCREW PLATES

Besly, Chas. H., & Co.
Butterfield Div., Union Twist Drill Co.
Card, S. W., Mfg. Co.
Greenfield Tap & Die Corp.
More Twist Drill & Mch. Co.
Pratt & Whitney Co.

SCREWS

Cap, Set, Safety Set and Machine

Allen Mfg. Co.
American Hardware Co.
American Screw Co.
Atlas Bolt Screw Co.
Bristol Co.
Central Screw Co.
Chandler Products Corp.
Continental Screw Co.
Corbin Screw Co.
Elco Tool & Screw Corp.
General Screw Mfg. Co.

Harper, H. M., & Co.
Holo-Krome Screw Corp.
International Screw Co.
Lansom & Sessions Co.
Milford Rivet & Machine Co.
National Acme Co.
National Lock Co.
National Screw & Mfg. Co.
New England Screw Co.
Parker, Chas., Co.
Parker-Kalon Corp.
Pawtucket Screw Co.
Phell Mfg. Co.
Reading Screw Co.
Republic Steel Corp.
(Union Drawn Steel Div.)
Russell, Burdall & Ward Bolt
& Nut Co.
Scovill Mfg. Co.
Southington Hardware Co.
Standard Pressed Steel Co.
Steel Co. of Canada, Ltd.
Sterling Bolt Co.
Whitney Screw Corp.
Wolverine Belt Co.

SCREWS, Self-Tapping Drive
Parker-Kalon Corp.

SCREWS, Thumb
American Screw Co.
Parker-Kalon Corp.
Williams, J. H., & Co.

SEALS AND RETAINERS
Oil or Grease
Garlock Packing Co.
Gits Bros. Mfg. Co.

SEAMLESS STEEL TUBING
See Tubing, Seamless Steel.

SECOND HAND MACHINERY, Etc.
Cincinnati Machinery Co., Inc.
Eastern Machinery Co.
Miles Machinery Co.
Morey Mchry. Co., Inc.
Simmons Machine Tool Corp.

SEPARATORS
Centrifugal
DeLaval Separator Co.

Magnetic
Frantz, S. G., Co., Inc.
Oil or Coolant
Barnes Drill Co.
National Acme Co.

SHAFTING, STEEL
Bethlehem Steel Co.
Cumberland Steel Co.
Jones & Laughlin Steel Corp.
National Tube Co.
(U. S. Steel Corp., Div.)
Ryerson, Joseph T., & Son, Inc.

SHAFTS
Standard Pressed Steel Co.

Flexible
Haskins, R. G., Co.
Stewart, F. W., Mfg. Co.
Stwand, N. A., & Co.

Hollow Bored
American Hollow Boring Co.
Bethlehem Steel Co.

Turned and Ground
Bethlehem Steel Co.
Cumberland Steel Co.
Jones & Laughlin Steel Corp.
Ryerson, Joseph T., & Son, Inc.

SHAPERS
American Tool Works Co.
Atlas Press Co.
Cincinnati Shaper Co.
General Engrg. & Mfg. Co.
Hendey Machine Co.
Machinery Mfg. Co.
Ohio Machine Tool Co.
Rockford Mch. Tool Co.

Vertical
Hanson-Whitney Mfg. Co.
Jones Machine Tool Wks., Inc.
Pratt & Whitney Co.
Rhodes Manufacturing Co.
Rockford Mch. Tool Co.

SHAPES, Structural
Aluminum Co. of America
Bethlehem Steel Co.
Cramp Brass & Iron Foundries Div.
Jones & Laughlin Steel Corp.

SHEARING MACHINERY
Bethlehem Steel Co.
Buffalo Forge Co.
Cincinnati Shaper Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
Hannifin Mfg. Co.
Hydropress Co., Inc.
Morgan Engineering Co.
Niagara Mch. & Tool Wks.
O'Neill-Irwin Mfg. Co.
Peck, Stow & Wilcox Co.
Quickwork-Whiting Div. of Whiting Corp.
Ryerson, Joseph T., & Son, Inc.
Watson-Stillman Co.
Yoder Co.

SHEARS, Alligator
Hill Acme Co.

SHEARS

Rotary
Bliss, E. W., Co.
Brown & Sharpe Mfg. Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
Niagara Mch. & Tool Wks.
Peck, Stow & Wilcox Co.
Quickwork-Whiting Div. of Whiting Corp.
Ryerson, Joseph T., & Son, Inc.
Union Twist Drill Co.

Squaring
Cincinnati Shaper Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
Niagara Mch. & Tool Wks.
Peck, Stow & Wilcox Co.

SHEET METALS
Aluminum Co. of America
American Brass Co.
Associated Metals
Bethlehem Steel Co.
Ingersoll Steel Div., Borg Warner Corp.
Ryerson, Joseph T., & Son, Inc.

SHEETS, Iron and Steel
Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Jones & Laughlin Steel Corp.
Republic Steel Corp.
(Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.

Perforated
Chicago Perforating Co.

SINE BARS
Johansson Div., Ford Motor Co.
Starrett, L. S., Co.
Vineco Corporation

SLEEVES
Cleveland Twist Drill Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.

SLOTTING MACHINES
Baker Brothers, Inc.
Consolidated Mch. Tool Corp.
Jones Machine Tool Wks., Inc.
Rockford Mch. Tool Co.
Sellers, Wm., & Co., Inc.

SOCKETS
Cleveland Twist Drill Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.
Williams, J. H., & Co.

**SOLDER FOR ALUMINUM
AND CAST IRON**
Cramp Brass & Iron Foundries Div.

SPECIAL MACHINERY AND TOOLS
American Measuring Instruments Corp.
American Type Foundries, Inc.
Baird Machine Co.
Baldwin-Southwark Corp.
Barnes Drill Co.
Barnes, W. F. & John, Co.
Bausch Machine Tool Co.
Bethlehem Steel Co.
Bilgram Gear & Mch. Wks.
Birdsboro Steel Fdy. & Mch. Co.
Blanchard Machine Co.
Bliss, E. W., Co.
Columbus Die, Tool & Machine Co.
Consolidated Mch. Tool Corp.
Cross Co.
Denison Engineering Co.
Earle Gear & Mch. Co.
Elgin Tool Wks., Inc.
Ex-Cell-O Corp.
Farrel-Birmingham Co., Inc.
Gairing Tool Co.
Gisholt Mch. Co.
Gorton, George, Mch. Co.
Grant Mfg. & Mch. Co.
Greenlee Bros. & Co.
Hannifin Mfg. Co.
Hartford Special Mchry. Co.
Hydraulic Press Mfg. Co.
Hill Acme Co.
Ingersoll Milling Mch. Co.
Jack & Heintz Precision Industries, Inc.
Jones, C. K., Inc.
Jones Machine Tool Wks., Inc.
Lake Erie Engineering Corp.
Langeller Mfg. Co.
LaSalle Engineering Co.
Lipe-Rollway Corporation
Moline Tool Co.
Morgan Engineering Co.
Morse Twist Drill & Mch. Co.
National Acme Co.
National Automatic Tool Co.
National Twist Drill & Tool Co.
New Britain Mch. Co.
New Jersey Gear & Mfg. Co.
Niagara Mch. & Tool Wks.
Oilgear Co.
Peck, Stow & Wilcox Co.
Pratt & Whitney Co.
Reed-Prentice Co.
Rogers, John M., Tool Corp.
Ruthman Machinery Co.
S. & S. Mch. Works

Sundstrand Mch. Tool Co.
Taft-Peirce Mfg. Co.
Union Twist Drill Co.
U. S. Tool Company, Inc.
V & O Press Co.
Wade Tool Co.
Waltham Mfg. Wks.

SPEED REDUCERS
Atlantic Gear Works, Inc.
Boston Gear Works, Inc.
Cleveland Worm & Gear Co.
Davis & Thompson Co.
DeLaval Steam Turbine Co.
Farrel-Birmingham Co., Inc.
Foot Bros. Gear & Machine Corp.
Ganschow Gear Co.
General Electric Co.
Grant Gear Works, Inc.
Master Electric Co.
Michigan Tool Co.
Morse Chain Co.
Philadelphia Gear Works
Shepard Niles Crane & Hoist Corp.

SPINDLES, Grinding
Ex-Cell-O Corporation
Pope Machinery Corp.

SPINDLES, Hollow Bored
American Hollow Boring Co.

SPINNING LATHES
See Chucking Machines.

**SPRING COILING AND FORMING
MACHINERY**
Baird Machine Co.

SPROCKET CHAINS
Atlantic Gear Works, Inc.
Boston Gear Works, Inc.
Grant Gear Works, Inc.
Morse Chain Co.
Philadelphia Gear Works

SPROCKETS
Atlantic Gear Works, Inc.
Boston Gear Works, Inc.
Eberhardt-Denver Co.
Foot Bros. Gear & Machine Corp.
Grant Gear Works, Inc.
Hartford Special Mchry. Co.
Morse Chain Co.
Philadelphia Gear Works

STAMPINGS, Sheet Metal
Adams Stamping Co.
Aluminum Co. of America
Quadriga Mfg. Co.

STAMPINGS, Steel
Worcester Pressed Steel Co.

STAMPS, Steel, and Marking Dies
Noble & Westbrook Mfg. Co.
Pittsburgh Stamp Co., Inc.
Sossner, Inc.

STEEL
Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Carpenter Steel Co.
Crucible Steel Co. of America
Firth-Sterling Steel Co.
Frasse, Peter A., & Co., Inc.
Holliday, W. J., & Co.
Ingersoll Steel Div., Borg Warner Corp.
Jones & Laughlin Steel Corp.
Republic Steel Corp.
(Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.
Simonds Saw & Steel Co.
Timken Roller Bearing Co.
Vanadium Alloys Steel Co.
Wheelock, Lovejoy & Co., Inc.

Cold Drawn
Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Crucible Steel Co. of America
Firth-Sterling Steel Co.
Jones & Laughlin Steel Corp.
Rustless Iron & Steel Div.,
American Rolling Mills Co.
Ryerson, Joseph T., & Son, Inc.
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See Plates, Surface.

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TAPPING TIPS*

From Woody Spencer's Notebook



CHECK AND DOUBLE CHECK!

Tapping troubles come sometimes because something or other isn't right before we start. 'Course, making sure the tap is right is plain common sense. But taking a little time to check other things always pays. For instance, is the hole size right? Is it perfectly round? Is your alignment correct, both tap and jig? If the hole is blind is there chip room at the bottom? Is the lubricant right? Is it clean and cool? How about speed?

Sound silly? Well maybe it does. But you know and I know how much some little thing like one of these can affect the job. So, to do better tapping, faster, make sure you're right first.



Woody Spencer's Tapping Tips aren't run here to offer any technical advice on tapping. They're just a series of hints, short cuts and ideas Woody has picked up in his rounds among the shops. And he puts them in here for whatever they're worth, just to help make some routine tapping job run a little smoother. If they do that, we feel they're well worth while.

But for the technical questions that come up—look to the engineers. Send us complete information on the job—material, diameter of hole, depth of thread, through or blind, lubricant used, etc. Our engineers will be glad to give you definite suggestions covering your problems.

NOTE: Woody Spencer's Tapping Tips will appear here as often as Woody gets time to write them up. Look for them.

Woody Spencer's Handy Tap guide is packed with useful information on tapping. It's free. Write for your copy on the Company letterhead.



THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company
Cleveland 3, Ohio

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See Drills, Twist.

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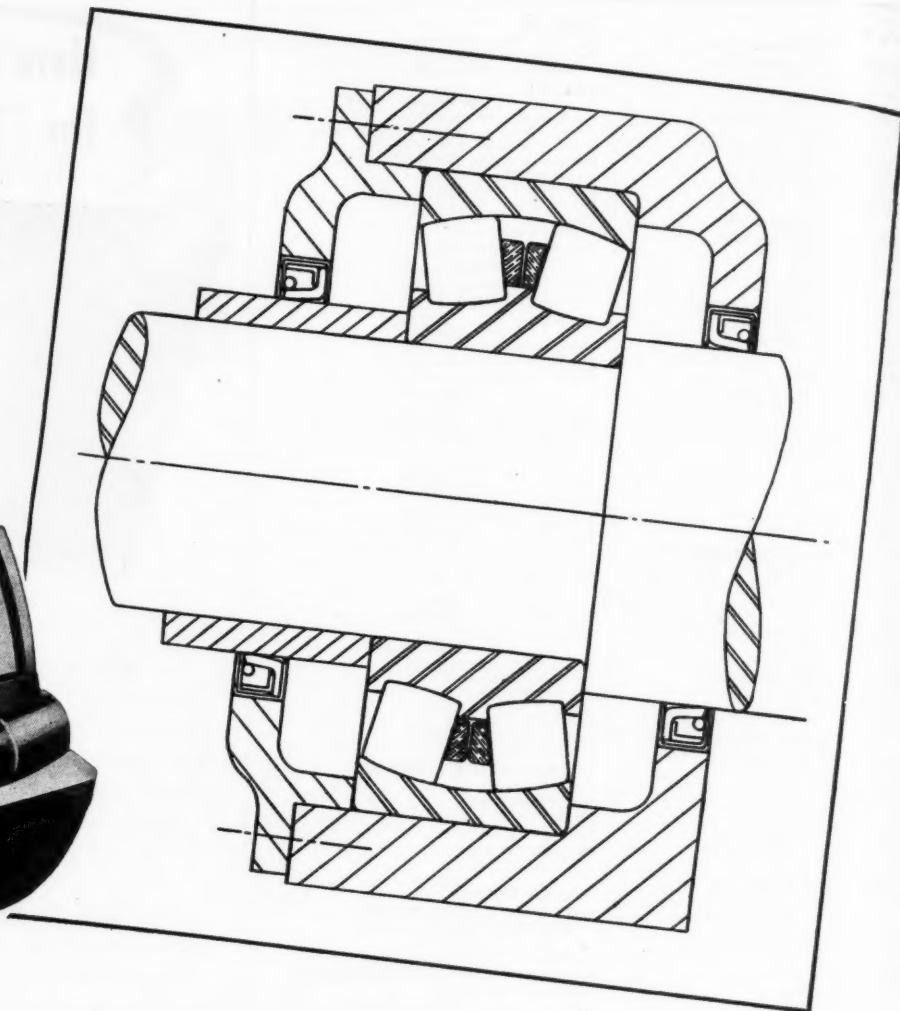
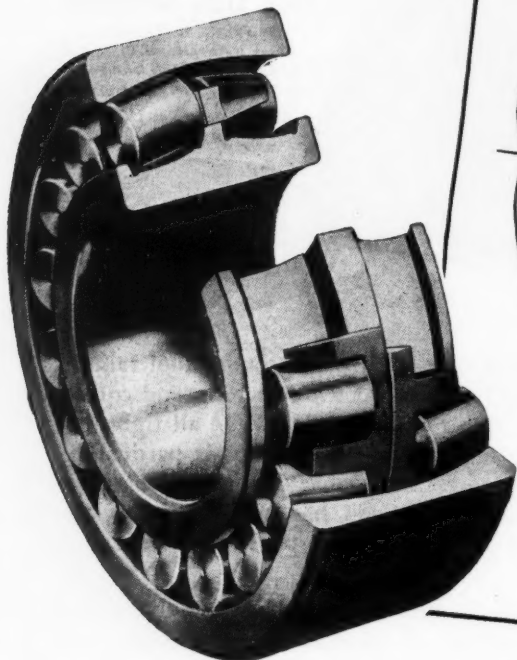
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ALPHABETICAL INDEX OF ADVERTISERS

A

Abrasive Machine Tool Co.	347
Ace Manufacturing Corp.	389
Acme Machine Tool Co.	365
Adams Stamping Corp.	32
Air Reduction Sales Co.	255
Allegheny Ludlum Steel Corp.	321
Allen-Bradley Co. Insert bet.	42-45
Allen Mfg. Co.	401
American Brake Shoe Co.	417
American Brass Co.	Insert bet. 60-63
American Broach & Mch. Co.	Insert bet. 70-85
American Hdwe. Corp.	227
American Hollow Boring Co.	378
American Optical Co.	298
American Screw Co.	227-278
American Tool Works Co.	24-25
Ames, B. C., Co.	345
Ampco Metal, Inc.	413
Anderson Brothers Mfg. Co.	Insert bet. 70-85
Arguto Oilless Bearing Co.	391
Armstrong-Blum Mfg. Co.	359
Armstrong Bros. Tool Co.	342
Arter Grinding Machine Co.	353
Atlantic Gear Works	386
Atlantic Screw Works	227
Atlas Bolt & Screw Co.	227
Automotive Gear Wks., Inc.	307
Avey Drilling Machine Co.	357
Axelsson Manufacturing Co.	Insert bet. 130-133

B

Baird Machine Co.	374
Baker Brothers, Inc.	233
Baldwin Locomotive Works, Locomotive & Southwark Div.	98-373
Ball & Roller Bearing Co.	391
Bantam Bearings Div. Torrington Co.	428
Barber-Colman Co. Insert bet.	70-85
Bardons & Oliver, Inc.	55
Barnes Drill Co. Insert bet.	70-85
Barnes, W. F. & John, Co.	Insert bet. 70-85
Bath, John, & Co., Inc.	327
Baumbach, E. A., Mfg. Co.	374
Bausch Machine Tool Co.	60
Bay State Abrasive Products Co.	65
Bennett Metal Treating Co.	391
Besly, Chas. H., & Co.	265
Bethlehem Steel Co.	96-406
Bilgram Gear & Mch. Wks.	387
Blanchard Machine Co.	112
Bliss, E. W., Co.	45
Bodine Corporation	416
Boston Gear Works, Inc.	385
Botwinik Bros., Inc.	407
Boyar-Schultz Corp.	352
Bradford Machine Tool Co.	368
Braun Gear Co.	384
Brown & Sharpe Mfg. Co.	192-193-285-395
Bryant Chucking Grinder Co.	58-68
Buhr Machine Tool Co.	356
Bullard Co.	256
Bunting Brass & Bronze Co.	247
Burke Machine Tool Co.	360
Butterfield Div. Union Twist Drill Co.	50

C

Caney-Otto Manufacturing Co.	305
Carboloy Co., Inc.	203
Carborundum Co.	336-337
Card, S. W., Mfg. Co., Div. Union Twist Drill Co.	51
Carlton Machine Tool Co.	354
Carlyle Johnson Mch. Co.	312
Carpenter Steel Co.	90-91-427
Central Screw Co.	227
Chambersburg Engineering Co.	340
Chandler Products Corp.	227
Chicago Perforating Co.	395
Chickson Co.	389
Cimcool Div., Cincinnati Milling Machine Co.	27

Cincinnati

Cincinnati Bickford Tool Co.	197
Cincinnati Gear Co.	386
Cincinnati Grinders Incorporated	10-11
Cincinnati Machinery Co., Inc.	407
Cincinnati Milling Machine Co.	8-9
Cincinnati Planer Co.	118
Cincinnati Shaper Co.	195
Cities Service Oil Co.	246
Clark Controller Co.	257
Classified Advertisements	404-408
Clearing Machine Corp.	64
Cleveland Automatic Machine Co.	240
Cleveland Crane & Eng. Co.	371
Cleveland Punch & Shear Works Co.	372
Cleveland Tapping Machine Co.	369
Cleveland Twist Drill Co.	100-241
Climax Molybdenum Co.	235
Colonial Broach Co.	229
Columbus Die, Tool & Machine Co.	400
Cone Automatic Machine Co., Inc.	116
Consolidated Machine Tool Corp.	52
Continental Screw Co.	227
Cooley Electric Mfg. Corp.	412
Corbin Screw Div.	227
Cosa Corporation	331
Coulter, James, Machine Co.	360
Criterion Machine Works	403
Cross Company	66
Crucible Steel Co. of America	87
Cumberland Steel Co.	95
Cuno Engineering Corp.	119

D

Danly Machine Specialties, Inc.	243
Davis & Thompson Co.	361
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co.	18-19
Davis Keyseater Co.	358
DeLaval Separator Co.	268
Delta Manufacturing Co.	244
Desmond-Stephan Mfg. Co.	350
Denison Engineering Co.	280
Detroit Bevel Gear Co.	384
Dieffendorf Gear Corp.	387
DoAll Company	325
Dow Chemical Co.	97
Dumore Co.	258

E

Eastern Machinery Co.	404
Eastern Machine Screw Corp.	394
Eberhardt-Denver Co.	387
Electro Refractories & Alloy Corp.	130
Elgin Tool Works	362-363
Elmes Engineering Works of American Steel Foundries	252
Errington Mechanical Laboratory	396
Etna Machine Co.	379
Ettco Tool Co.	308
Ex-Cell-O Corporation	201

F

Fairfield Manufacturing Co.	388
Farquhar, A. B., Co.	377
Farrel-Birmingham Co., Inc.	418
Federal Bearings Co., Inc.	136
Federal Machine & Welder Co.	332-333
Fellows Gear Shaper Co.	4-5
Firth-Sterling Steel Co.	22-23
Fitchburg Grinding Machine Corp.	351
Foot-Bros. Gear & Mch. Corp.	339
Foot-Burt Company	309
Fosdick Machine Tool Co.	355
Fraser, Peter A., & Co., Inc.	88
Frew Machine Co.	361

G

Gairing Tool Co.	269
Galland-Henning Mfg. Co.	414
Gallmeyer & Livingston Co.	358

Gammons-Hoagland Co.	396
Ganschow Gear Co.	386
Gardner Machine Co.	134
Garlock Packing Co.	392
Gear Grinding Machine Co.	295
Gear Specialties	125
General Electric Co.	236-237-239-275
Geometric Tool Co.	Insert bet. 104-105
Giddings & Lewis Machine Tool Co.	18-19
Gisholt Machine Co.	205-207-225
Gits Bros. Mfg. Co.	388
Gleason Works	Front Cover
Gorton, George, Machine Co.	127-299

Goss & DeLeeuw Machine Co.	368
Graham Mfg. Co.	402
Grant Gear Works	382
Grant Mfg. & Machine Co.	374
Gray Machine Co.	374
Greenfield Tap & Die Corp.	Insert bet. 104-105
Greenlee Bros. & Co.	Insert bet. 70-85
Grinders & Fixtures Inc.	378
Grob Brothers	368
Gulf Oil Corporation	135
Gwilliam Co.	391

H

Hamilton Alexander Institute	399
Hanchett Manufacturing Co.	110-111
Hannifin Mfg. Co.	245
Hanson Whitney Machine Co.	324
Hardinge Brothers, Inc.	126
Harper, H. M., Co.	227
Hartford Special Mchry. Co.	397
Haskins, R. G., Co.	63
Hayes, C. I., Inc.	408
Haynes Stellite Co.	343
Heald Machine Co.	Inside Front Cover
Heim Company	346
Hendey Machine Co.	274
Henry & Wright Mfg. Co.	420
Hill Acme Co.	122-123
Hilliard Corporation	390
Holliday, W. J., & Co.	322
Holo-Krome Screw Corp.	304
Huther Bros. Saw Mfg. Co.	358
Hydraulic Machinery, Inc.	323
Hydraulic Press Mfg. Co.	67
Hydrex Press, Inc.	316

I

Ingersoll Milling Machine Co.	105
Ingersoll-Rand	284
International Screw Co.	227

J

Jack & Heintz Precision Industries, Inc.	300-301
Johnson Bronze Co.	86
Jones & Lamson Machine Co.	6-7
Jones & Laughlin Steel Corp.	213
Jones Machine Tool Works, Inc.	358

K

Kearney & Trecker Corp.	28-29-121
Kempsmith Machine Co.	35
Kennametal, Inc.	219
Kingsbury Machine Tool Corp.	279
Kux Machine Co.	361

L

L&J Press Corp.	376
Lake Erie Engineering Corp.	282
Lamson & Sessions Co.	227
Landis Machine Co.	2-3
Landis Tool Co.	14-15
Langelier Mfg. Co.	354-376
Lapointe Machine Tool Co.	271
La Salle Engrg. Co.	360
LeBlond, R. K., Mch. Tool Co.	108-109
Leeds & Northrup Co.	140
Leland-Gifford Co.	288

Lempco Products, Inc.	410
Lepel High Frequency Laboratories, Inc.	249
Lewis, B. C., Mfg. Co., Inc.	399
Lincoln Electric Co.	46-47
Linde Air Products Co.	296
Lodge & Shipley Machine Tool Co.	262
Logan Engineering Co.	303
Lord Manufacturing Co.	69
Lovejoy Flexible Coupling Co.	390
Lovejoy Tool Co., Inc.	310
Lowie Bros. Co.	103
Lucas Machine Tool Co.	358
Luers, J. Milton	395

M

Madison-Kipp Corp.	306
Manufacturers Screw Products	227
Massachusetts Gear & Tool Co.	382
Master Electric Co.	394
Materials Section	85-104
Mattison Machine Works	Insert bet. 70-85
McCrosky Tool Corp.	56
McGill Manufacturing Co., Inc.	294-396
McIntyre Co.	283
Meisel Press Mfg. Co.	382
Merz Engineering Co.	400
Micromatic Hone Corp.	272-273
Miles Machinery Co.	404
Milford Rivet & Machine Co.	227
Moline Tool Co.	356
Monarch Machine Tool Co.	329
Moore Special Tool Co., Inc.	334
Morey Machinery Co., Inc.	366
Morgan Engineering Co.	388
Morse Chain Co.	267
Morse Twist Drill & Machine Co.	20-21
Mummert-Dixon Co.	360

N

National Acme Co.	106-107
National Automatic Tool Co.	287
National Broach & Mch. Co.	313
National Lock Co.	227
National Machinery Co.	38
National Screw & Mfg. Co.	227
National Twist Drill & Tool Co.	291
Newark Gear Cutting Mch. Co.	352
New Britain Machine Co., New Britain-Gridley Mch. Div.	198-199
New England Screw Co.	227
New Jersey Gear & Mfg. Co.	382
Niagara Machine & Tool Works	370
Nichols, W. H., & Sons	42
Noble & Westbrook Mfg. Co.	399
Norma-Hoffmann Bearings Corp.	359
Norton Company	276-277

O

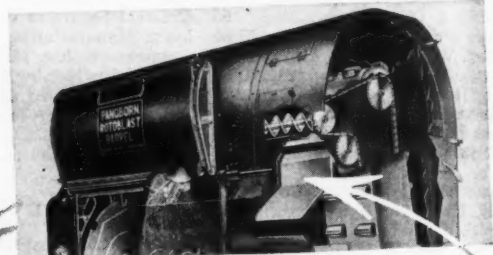
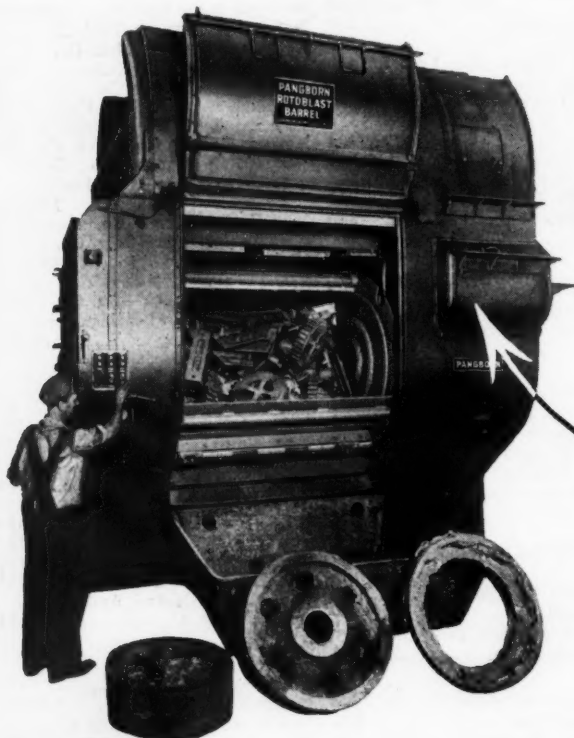
Oakite Products, Inc.	89
Oakland Engineering Co.	390
Ohio Crankshaft Co.	53
Ohio Gear Co.	381
Oilgear Company	261
Oliver Instrument Co.	349
O'Neil-Irwin Mfg. Co.	374
Orange Roller Bearing Co., Inc.	297
Oster Manufacturing Co.	128
Otis Elevator Co.	264
Ozalid Div., General Aniline & Film Corp.	214

P

Pangborn Corp.	430
Parker-Kalon Corp.	227-326
Pawtucket Manufacturing Co.	397
Pawtucket Screw Co.	227
Peck, Stow & Wilcox Co.	378
Perkins Machine & Gear Co.	421
Pheoll Manufacturing Co.	227
Philadelphia Gear Works, Inc.	383
Phillips Screw Manufacturers	227
Pittsburgh Gear & Mch. Co.	388
Pope Machinery Corp.	120
Potter & Johnston Machine Co.	36-37
Pratt & Whitney Div. Niles-Bement-Pond Co.	250

ALPHABETICAL INDEX OF ADVERTISERS—Continued

Procurier Safety Chuck Co.	401	Sheldon Machine Co., Inc.	366	Texas Company	57	Walker, O. S., Co., Inc.	328
Production Machine Co.	350	Shell Oil Co., Inc.	220	Thomson Grinder Co., Inc.	253	Walker-Turner Co., Inc.	70
Producto Machine Co.	408	Shepard Niles Crane & Hoist Corp.	411	Threadwell Tap & Die Co.	139	Walls Sales Corp.	352
Q				Tide Water Associated Oil Co.	117	Waltham Machine Works	376
Quadriga Manufacturing Co.	395	Shore Instrument & Mfg. Co., Inc.	398	Timken Roller Bearing Co.	101-Back Cover	War Assets Administration	302-335
R				Titeflex, Inc.	137	Warner & Swasey Co.	30-31
R and L Tools	318	Sidney Machine Tool Co.	209	Torrington Co., also Bantam Bearings Div.	286-374-428	Warren City Manufacturing Co.	115
Raybestos-Manhattan, Inc.	393	Sier-Bath Gear Co., Inc.	384	Trico Fuse Mfg. Co.	390	Westinghouse Electric Corp.	281
Manhattan Rubber Div.	393	Simmons Machine Tool Corp.	405	Triplex Machine Tool Corp.	348	Wheelock, Lovejoy & Co., Inc.	394
Reading Screw Co.	227	Simonds Abrasive Co.	251	Tuthill Pump Co.	270	Whiting Corporation	231
Reed-Prentice Corp.	133	Simonds Saw & Steel Co.	54	Twin Disc Clutch Co.	320	Williams, J. H., & Co.	263
Reeves Pulley Co.	210	Sinclair Refining Co.	104	U			
Rehnberg-Jacobson Mfg. Co., Insert bet. 70-85		Smit, J. K., & Sons, Inc.	350	Union Carbide & Carbon Corp.	296	Wilson, K. R.	311
Reid Bros. Co., Inc.	348	Socony-Vacuum Oil Co., Inc.	124	Union Drawn Steel Div., Republic Steel Corp.	92-93	Wilson Mechanical Instrument Co.	395
Reliance Electric & Engrg. Co.	330	Sommer & Adams Co.	317	Union Manufacturing Co.	248	Winter Brothers	292
Republic Steel Corp.	92-93	South Bend Lathe Works	138	Union Twist Drill Co.	49-50-51	Wolverine Bolt Co.	227
Robot Machinery Co.	419	Southington Hardware Mfg. Co.	227	United States Products Co.	398	Wood & Spencer Co.	426
Rockford Clutch		Springfield Machine Tool Co.	364	Universal Boring Machine Co.	368	Woodworth, N. A., Co.	242
Rockford Machine Tool Co., Insert bet. 70-85		Stahl Gear & Machine Co.	382	Universal Drafting Machine Co.	Inside Back Cover	Worcester Pressed Steel Co.	338
Rogers, John M., Tool Corp.	396	Standard Oil Co. (Indiana), Insert bet. 32-35		Used Machinery	404-408	Y	
Rogers Machine Works, Inc.	344	Standard Pressed Steel Co.	259-314-341	U. S. Tool Company, Inc.	16-17	Yoder Company	375
Rotor Tool Co.	48	Standard Tool Co., Insert bet. 112-115		V			
Rowbottom Machine Co.	360	Stark Tool Company	402	V & O Press Co., Inc.	378	Zeh & Hahnemann Co.	376
Russell, Burdsall & Ward Bolt & Nut Co.	227	Starrett, L. S., Co.	129	Valvair Corporation	402	IN CLASSIFIED SECTION	
Rustless Iron & Steel Div., American Rolling Mill Co.	99	Steel Company of Canada, Ltd.	227	Vanadium-Alloys Steel Co.	94	Armstrong Cork Co.	408
Ruthman Machinery Co.	293	Steel Improvement & Forge Co.	102	Van Keuren Co.	289	Bethlehem Steel Co.	406
Ryerson, Joseph T., & Son, Inc.	85	Stearns-Roger Mfg. Co.	386	Van Norman Co.	12-13	Botwinik Brothers, Inc.	407
S				Veeder-Root, Inc.	315	Burgess Battery Co.	406
S. & H. Soft Hammer Products Co.	396	Sterling Bolt Co.	227	Victory Engineering & Mch. Works, Inc.	400	Castelli, F. C., Company	404
S & S Machine Works	378	Sticht, Herman H., Co., Inc.	398	Viking Pump Co.	391	Cincinnati Machinery Co., Inc.	407
Schatz Manufacturing Co.	290	Stiger Precision Products Co.	403	Vinco Corporation	39-40-41	Eastern Machinery Co.	404
Scherr, George, Co., Inc.	398	Stokerunit Corporation	380	Vitrified Wheel Co.	353	General Armature & Mfg. Co.	406
Schneible, Claude B., Co.	392	Strand, N. A., & Co.	352	W			
Scovill Mfg. Co.	227	Stuart, D. A., Oil Co.	415	Wade Tool Co.	367	Interstate Machinery Co.	406
Seneca Falls Machine Co.	238	Sundstrand Machine Tool Co., Insert bet. 70-85		Walder Kohinoor, Inc.	319	Miles Machinery Co.	404
Shakeproof, Inc.	227	Sunnen Products Co.	254	Y			
T				Z			
Taft-Peirce Mfg. Co.	26	Sun Oil Co.	217	Yoder Company	375	IN CLASSIFIED SECTION	
Taylor & Fenn Co.	356	U					
Taylor Machine Co.	382	V					
Taylor-Winfield Corp.	266	U					
U							
Union Carbide & Carbon Corp.	296	Z					
Union Drawn Steel Div., Republic Steel Corp.	92-93	IN CLASSIFIED SECTION					
Universal Boring Machine Co.	368	Z					
Universal Engineering Co.	260	IN CLASSIFIED SECTION					
Used Machinery	404-408	Z					
U. S. Tool Company, Inc.	16-17	IN CLASSIFIED SECTION					
V							
V & O Press Co., Inc.	378	Z					
Valvair Corporation	402	IN CLASSIFIED SECTION					
Vanadium-Alloys Steel Co.	94	Z					
Van Keuren Co.	289	IN CLASSIFIED SECTION					
Van Norman Co.	12-13	Z					
Veeder-Root, Inc.	315	IN CLASSIFIED SECTION					
Victory Engineering & Mch. Works, Inc.	400	Z					
Viking Pump Co.	391	IN CLASSIFIED SECTION					
Vinco Corporation	39-40-41	Z					
Vitrified Wheel Co.	353	IN CLASSIFIED SECTION					
W							
Wade Tool Co.	367	Z					
Walder Kohinoor, Inc.	319	IN CLASSIFIED SECTION					
Y							
Yoder Company	375	Z					
Z							
Zeh & Hahnemann Co.	376	IN CLASSIFIED SECTION					
IN CLASSIFIED SECTION							
Armstrong Cork Co.	408	Z					
Bethlehem Steel Co.	406	IN CLASSIFIED SECTION					
Botwinik Brothers, Inc.	407	Z					
Burgess Battery Co.	406	IN CLASSIFIED SECTION					
Castelli, F. C., Company	404	Z					
Cincinnati Machinery Co., Inc.	407	IN CLASSIFIED SECTION					
Eastern Machinery Co.	404	Z					
General Armature & Mfg. Co.	406	IN CLASSIFIED SECTION					
Interstate Machinery Co.	406	Z					
Miles Machinery Co.	404	IN CLASSIFIED SECTION					
Polymer Corporation	406	Z					
Production-Engineering	407	IN CLASSIFIED SECTION					
Simmons Machine Tool Corp.	405	Z					



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Making abrasive last longer is one of the many features responsible for the efficiency and economy of the Pangborn ROTOBlast® Rocker Barrel.

An exclusive Abrasive Separator and Cleaning System restores usable abrasive to its original cleanliness and efficiency — by means of stratification and pneumatic treatment. 12 tons of metal abrasives an hour are normally cleaned this way.

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Pangborn

PANGBORN CORPORATION, HAGERSTOWN, MARYLAND

430—MACHINERY, September, 1946

THE *Universal* BOARDMASTER

THE
DRAFTING
MACHINE
WITH

New SMOOTHNESS AND EASE OF CONTROL

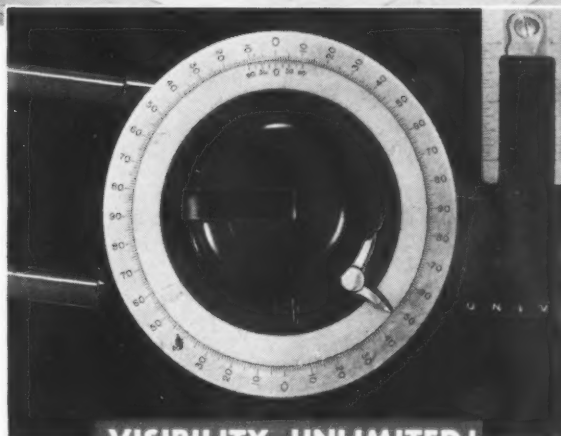
The Universal BOARDMASTER Drafting Machine is completely new—redesigned throughout to give ruggedness and lasting accuracy, new smoothness and ease of control. BOARDMASTER'S Centralized Control Group locates every operating control at the fingertips—ready for instant, natural operation without visual reference. Baseline selector, indexing control and vernier clamp are all designed for rapid, positive action. These features, plus automatic stops for every 15°, make it possible to operate the BOARDMASTER virtually by "feel" alone.

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UNIVERSAL DRAFTING MACHINE CO.
CLEVELAND 14, OHIO



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BOARDMASTER'S overarm construction gives complete 360° visibility of dial and vernier readings at all times. No obstructions, no blind spots, no cramped or misplaced controls in any position!

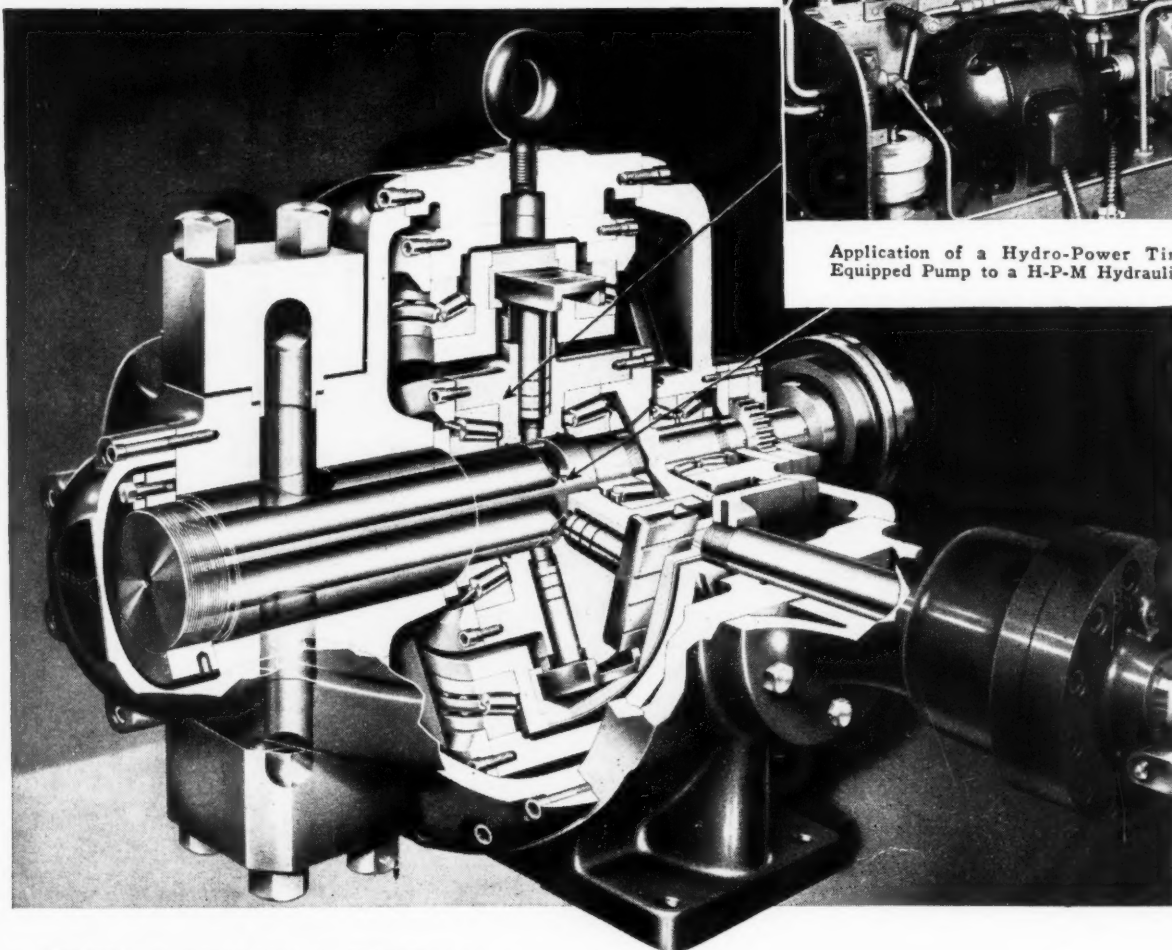


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A

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full protection against radial, thrust and combined loads — therefore greater endurance.

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